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US Army Corps
of Engineers®
Tulsa District

MULTIPLE AWARD TASK ORDER (MATOC) CONTRACT FOR DESIGN-BUILD INDEFINITE DELIVERY CONTRACT FOR CONSTRUCTION/DESIGN-BUILD SERVICES FOR SOUTHWEST DIVISION, PRIMARILY FOR TULSA DISTRICT

SET ASIDE FOR HUB-ZONE BUSINESSES

TASK ORDER *AM 1 RFP02*

ADVANCED INDIVIDUAL TRAINING (AIT) BARRACKS COMPLEX BATTALION HEADQUARTERS (AIT BN/HQ)

AUGUST 2010

SECTION 01 10 00.*AM1 RFP02*
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1.0 PROJECT OBJECTIVES

The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

Comparison of Military Facilities to Civilian Facilities

Military Facility	Civilian Facility
Battalion Headquarters (BNHQ)	Office Building

It is the Army's objective that these buildings will have a 25-year useful design life before a possible re-use/re-purpose or renovation requirement, to include normal sustainment, restoration, modernization activities and a 50-year building replacement life. Therefore, the design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles.

The project site should be developed for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. **The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the lowest Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.**

1.1. SECTION ORGANIZATION

This Section is organized under 6 major “paragraphs”.

(1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable “civilian” type buildings.

(2) Paragraph 2 describes the scope of the project.

(3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.

(4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.

(5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.

(6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

2.0 SCOPE

2.1. ADVANCED INDIVIDUAL TRAINING COMPLEX

2.1.1. NOT USED

2.1.2. BATTALION HEADQUARTERS

Provide one standard BNHQ. This facility type is to house administrative and command operations. Assume 20 percent of personnel are female, unless otherwise indicated.

The maximum gross area for the BNHQ is 12,300 square feet.

The floor plans provided in Attachment A - Drawings indicate functional and operational arrangements that meet user operability requirements.

2.1.3. NOT USED

2.1.4. NOT USED

2.1.5. NOT USED

2.2. SITE:

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Include Antiterrorism/Force Protection measures in the facility design in accordance with applicable criteria. The Contractor shall be responsible for all repairs to existing sidewalks, pavements, curb and gutter, utilities, and/or landscaping damaged as a result of his construction activities.

Approximate area available 0.34 acres in the limits of construction, as shown on the site layout plan. Refer to Appendix J - Drawings.

2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. Fire extinguishers are GF/GI personal property, while fire extinguisher brackets and cabinets are Contractor furnished and installed CF/CI. Include tables/cabinets/carts/etc. for GFGI equipment that is not freestanding in furniture design. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: Ice makers

- Vending Machines
- Dumpsters

2.4. FURNITURE REQUIREMENTS

Provide furniture design for all spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, any existing items to be reused, etc. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The general contractor shall accommodate that effort with allowance for entry of the furniture vendor/installer onto this project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of this project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; the general contractor shall make the final connections to the building electrical systems under this contract. Furthermore, the general contractor shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops as applicable, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems under this contract.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CF/CI). CF/CI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package.

2.5. NOT USED

3.0 ADVANCED INDIVIDUAL TRAINING COMPLEX (AIT)

3.1. General

Advanced Individual Training (AIT) complexes are required by the Army to encompass living, dining, training, and administrative/command operations. This AIT complex will be comprised of: Battalion Headquarters (BNHQ), . These facilities, with outdoor training areas and any additional support facilities, shall be arranged on the site as a unit to allow the battalion to live, eat, train, and work together.

BNHQ is comprised of administration, command operations, special functions, storage and classroom components

3.2. FUNCTIONAL AND AREA REQUIREMENTS

Gross building area shall be calculated in accordance with Appendix Q. Net area is measured to the inside face of the room or space walls. Minimum dimension where stated shall be measured to the inside face of the defining enclosure. Net area requirements for programmed spaces are included in this paragraph. If net area requirements are not specified, the space shall be sized to accommodate the required function and to comply with code requirements, overall gross area limitations, and any other requirement of this RFP. Area requirements for corridors, stairs, and mechanical rooms will typically be left to the discretion of the offeror.

3.2.1. ACCESSIBILITY REQUIREMENTS

The B/COF and LEB facilities are intended for occupancy and/or use by able-bodied military personnel only. In accordance with paragraph 3(a) of the Deputy Secretary of Defense Memorandum dated 31 October 2008: DoD Access for People with Disabilities, facilities for able-bodied personnel are exempt from accessibility requirements. Headquarters buildings shall comply with the Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities as currently amended. In accordance ABA Section F203.6, Central Energy Plants, if provided, are exempt from accessibility requirements.

3.2.2. NOT USED

3.2.3. BNHQ

3.2.3.1. Functional Space Requirements

(a) S-1 Office: Provide a private administrative office.

(b) Personnel and Administrative Work Spaces: Provide an office for multiple personnel.

(c) Staff Duty Office: Provide a security office for building surveillance. The walls separating this room from the corridors shall incorporate a built-in counter with a wrap around laminated glass picture window to provide the duty officer a view of the lobby and access to the command and administration section. Picture window shall incorporate a lockable, laminated glass sliding window. Sliding glass window shall be 24 inches wide by 36 inches high minimum.

(d) Message Center: Provide a room for distributing directives. A built-in lockable counter with laminated sliding glass window shall be integrated with a rolling shutter door between this room and the corridor. Counter opening shall be 36 inches wide by 36 inches high minimum.

(e) Battalion Executive Officer (BN XO): Provide a private administrative office.

(f) Command Sergeant Major (CMD SGT MAJ): Provide a private administrative office.

(g) Battalion Commander (BN CO): Provide a private administrative office.

(h) Toilet: Provide toilet for administrative space.

(i) Coffee Bar: Provide built-in counter with deep sink, wall and base cabinets, and shelf to accommodate microwave.

(j) Conference Room: Provide conference room seating for approximately 20 persons.

(k) Supply Storage: Provide storage room for miscellaneous administrative items.

(l) S-2 Office: Provide a private administrative office.

(m) Intelligence Work Spaces: Provide an administrative office for multiple personnel.

(n) SIPRNET: Provide secure communication room with design and construction in accordance with AR 380-5, Department of the Army Information Security Program.

(o) Chaplain: Provide a private administrative office.

(p) Chaplain Assistant: Provide a private administrative office to serve as reception for the Chaplain.

(q) S-3 Office: Provide a private administrative office.

(r) Training and Operations Work Spaces: Provide an administrative office for multiple personnel.

(s) S-4 Office: Provide a private administrative office.

(t) Supply and Logistics Work Spaces: Provide an administrative office for multiple personnel.

(u) Instructor Work Space: Provide an administrative office for multiple personnel.

(v) Classroom: Large classroom space shall be divided into three equal classroom areas with ceiling hung, moveable partitions. Partitions shall have a minimum STC rating of 45. Each classroom must have a separate exit. Each classroom is intended to provide adequate space for training of 60-65 persons in a three classroom arrangement or to support large gatherings of approximately 200 persons with the partitions retracted.

(w) Classrooms Corridor: Provide a circulation area in front of the classrooms. Provide four open clothes closets in corridor adjacent to classrooms. Each closet shall have a full length shelf and clothing rod.

(x) Men's Toilet/Shower: Provide two shower stalls and toilet facilities to serve the public and administrative personnel assigned to headquarters. Provide a dressing area with a built-in 18 inch wooden bench adjacent to each shower stall.

(y) Women's Toilet: Provide one shower stall and toilet facilities to serve the public and administrative personnel assigned to headquarters. Provide a dressing area with a built-in 18 inch wooden bench adjacent to the shower stall.

(z) Janitor: Provide janitor’s closet with a 10 inches deep floor mounted stainless steel mop sink, with hot and cold service faucet, a four holder mop rack, and two 18 inch deep by 48 inch long heavy duty stainless steel shelves for storage of cleaning supplies. Janitor’s closet shall have space for storage of buckets and vacuum.

(aa)Vending: Vending area shall be sized to accommodate three full-size vending machines.

(bb)Lobby: Provide a handicapped accessible entry lobby. Lobby shall include a vestibule or enclosed transition space between the exterior and interior of the building. The vestibule shall be a minimum of 7 feet between doors.

(cc) Corridor: Provide 6 foot minimum width corridors.

(dd)Mechanical, Electrical, and Telecommunications Rooms: Mechanical rooms shall accommodate space for equipment maintenance/repair access without having to remove other equipment. Mechanical, electrical and telecommunications rooms shall be keyed separately for access by Installation maintenance personnel. First floor exterior access is required for centralized mechanical room. All telecommunications rooms shall be conditioned space. Telecommunications room will be provided on each floor in accordance with the latest I3A guidance. The Telecommunications room provides a demarcation point between the outside plant cable and the building telecommunications cabling. Refer to paragraphs 3.6 MECHANICAL REQUIREMENTS and 3.7 ELECTRICAL AND TELECOMMUNICATIONS REQUIREMENTS for additional information.

3.2.3.2. Space Allocation

BNHQ MINIMUM SQUARE FOOTAGE REQUIREMENTS NET SQUARE FEET (NSF)	
	TOTAL NSF
S-1	110
PERSONNEL AND ADMINISTRATIVE WORK SPACES	1,050
STAFF DUTY OFFICE	110
MESSAGE CENTER	150

BNHQ MINIMUM SQUARE FOOTAGE REQUIREMENTS NET SQUARE FEET (NSF)	
	TOTAL NSF
EXECUTIVE OFFICER	150
SERGEANT MAJOR	150
BATTALION COMMANDER	200
COMMAND SUITE RESTROOM	50
COFFEE BAR	45
CONFERENCE ROOM	450
SUPPLY STORAGE	100
S-2	110
INTELLIGENCE WORK SPACES	400
SIPRNET ROOM	65
CHAPLAIN	150
CHAPLAIN ASSISTANT	110
S-3	110
TRAINING AND OPERATIONS WORK SPACES	530
S-4	110
SUPPLY AND LOGISTICS WORK SPACES	210
INSTRUCTOR WORK SPACE	325
CLASSROOMS	3075
CLASSROOMS CORRIDOR	MINIMUM 10’-0” WIDE
MEN’S TOILET/SHOWER	230
WOMEN’S TOILET/SHOWER	230
JANITOR	30
VENDING	45
CORRIDORS AND VESTIBULES	MINIMUM 6’-0” WIDE
LOBBY WITH VESTIBULES	MINIMUM 10’-0” WIDE
MECHANICAL, TELECOMMUNICATIONS AND ELECTRICAL	AS NEEDED
TELECOMMUNICATIONS	110

3.2.4. NOT USED

3.2.5. NOT USED

3.2.6. NOT USED

3.3. SITE REQUIREMENTS

3.3.1. Walks: Provide pedestrian walks within the designated construction area and connect to existing sidewalks, where applicable.

(a) Sidewalks shall be a minimum of 6 feet wide. Troop formation sidewalks shall be a minimum of 15 feet wide. Troop formation sidewalks that are also designed to support emergency and service vehicle traffic shall be a minimum of 20 feet wide per NFPA requirements. Walks paralleling buildings shall be located beyond the eave drip line and at least 5 feet from the foundation.

(b) Non-vehicular pedestrian and troop formation sidewalks shall be constructed of Portland Cement Concrete and have a minimum nominal thickness of 4 inches. Joint patterns shall be designed in accordance with American Association of State Highway and Transportation Officials (AASHTO) standards and shall be uniform and symmetrical. The length to width ratio shall not exceed 1.25 for non-reinforced pavements.

(c) Troop formation sidewalks designed to support emergency and service vehicle traffic will be considered roadway pavements and shall be designed to meet AASHTO standards. Vehicular supported walks shall be constructed of Portland Cement Concrete and shall have a minimum nominal thickness of 7 inches. Joints shall be designed in accordance with AASHTO standards and shall be uniform and symmetrical. The length to width ratio shall not exceed 1.25 for non-reinforced pavements.

3.3.2. Not Used

3.3.3. Not Used

3.3.4. Not Used

3.4. ARCHITECTURAL REQUIREMENTS

3.4.1. Hardware

(a) Fire Department Secure Lock-Box: Knox-Vault 3200 Series (Single Lock Model).

(b) Finish Hardware: All hardware shall be consistent and shall conform to ANSI/BMHA standards for Grade 1. All requirements for hardware keying shall be coordinated with the Contracting Officer. Hardware finish shall conform to ANSI/BHMA A156 18; finish shall be Code # ANSI 626 or ANSI 630. Extension of the existing installation keying system shall be provided. Installation keying system is Best Lock. Locksets shall have interchangeable cores. Cores shall have no fewer than seven pins. Cores for locksets other than those for mechanical, electrical, and telecommunications rooms shall be manufactured by BEST. Locksets for mechanical, electrical and telecommunications rooms only shall be keyed to the existing Installation utilities master keying system. Deadbolt locks shall be installed on mechanical, electrical and telecommunications rooms keyed to the Installation keying system. Disassembly of knob or lockset shall not be required to remove core from lockset. All locksets and exit devices shall accept same interchangeable cores. Plastic cores are unacceptable. Door hardware and security requirements must be coordinated with the functional requirements, the room-by-room criteria, and the electrical security/fire alarm system requirements of this document. Provide all hardware necessary to meet the requirements of applicable codes for fire doors and exit doors. Provide closers for all doors opening to corridors and as required by codes.

3.4.2. Special Acoustical Requirements

3.4.2.1. Exterior walls and roof/floor/ceiling assemblies, doors, windows and interior partitions shall be designed to provide for attenuation of external noise sources such as airfields in accordance with applicable criteria. Provide sound insulation to meet a minimum rating of STC 42 at walls and floor/ceiling assemblies. At interior doors provide solid core wood doors in metal frame with sound insulation to meet a minimum rating of STC 33. In addition to the sound insulation required, video teleconferencing areas shall meet a Noise Criteria (NC) 30 rating in accordance with ASHRAE Fundamentals Handbook.

3.4.2.2. Sound conditions and levels for interior spaces, due to the operation of mechanical and electrical systems and devices, shall not exceed levels as recommended by ASHRAE handbook criteria. Provide acoustical treatment for drain lines and other utilities to prevent noise transmission into the interior of sleeping units.

3.4.3. Exterior Design Objectives

3.4.3.1. Exterior Walls: Provide durable materials.

3.4.3.2. Roof System: Minimum roof slope for membrane roof systems shall be 1/4 inch per foot. Minimum roof slope for pitched roof systems shall be 3 inches per foot. Membrane roof systems shall be fully adhered. Structural standing seam metal roofs shall comply with the requirements of ASTM E 1592. Roof system shall be Underwriters Laboratory (UL 580 Class 90) rated or Factory Mutual Global (FM) I-90 rated. Roof system shall comply with applicable criteria for fire rating.

(a) Roof Mounted Equipment: For roof mounted equipment, provide permanent access walkways and platforms to protect roof. Roof mounted equipment on pitched roof systems is unacceptable. Roof mounted equipment on membrane roof systems shall be completely screened by the roof parapet.

(b) Roof access from building exterior is prohibited.

3.4.3.3. Trim and Flashing: Gutters, downspouts, and fascias shall be factory pre-finished metal and shall comply with SMACNA Architectural Sheet Metal Manual.

3.4.3.4. Bird Habitat Mitigation: The Contractor shall provide details in the design necessary to eliminate the congregating and nesting of birds at, on, and in the facility.

3.4.3.5. Exterior Doors and Frames:

(a) Main Entrance Doors: Aluminum storefront doors and frames with Architectural Class 1 anodized finish, fully glazed, with medium or wide stile for entry into lobbies or corridors. Provide doors complete with frames, framing members, subframes, transoms, sidelights, trim, applied muntins, and accessories. Framing systems shall have thermal-break design. Storefront systems shall comply with wind-load requirements of applicable codes and criteria and shall comply with the requirements of UFC 4-010-01.

(b) Other Exterior Doors: Exterior doors and frames opening to spaces other than corridors or lobbies shall be galvanized insulated hollow metal and comply with ANSI A250.8/SDI 100. Doors shall be heavy duty (grade 2) insulated with 18-gage steel cladding; top edge closed flush; A60 galvannealed. Frames shall be 12-gauge, with continuously welded mitered corners and seamless face joints. Doors and frames shall be constructed of hot dipped zinc coated steel sheet, complying with ASTM A653, Commercial Steel, Type B, minimum A40 coating weight; factory primed. Fire-rated openings shall comply with applicable codes, and the requirements of the labeling authority. Door and frame installation shall comply with applicable codes and criteria including UFC 4-010-01.

3.4.3.6. Exterior Windows: Provide insulated, high efficiency window systems, with thermally broken frames complying with applicable codes and criteria including UFC 4-010-01. Curtain wall systems shall be capable of withstanding area wind loads, thermal and structural movement required by location and project requirements, and shall comply with applicable codes and criteria including UFC 4-010-01.

3.4.3.7. Exterior Louvers: Exterior louvers shall have bird screens and shall be designed to exclude wind-driven rain. Exterior louvers shall be made to withstand wind loads in accordance with the applicable codes. Wall louvers shall bear the Air Movement & Control Association (AMCA) International certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. Louver finish shall be factory applied.

3.4.4. Building Interior

Interior Design Objectives: Provide durable materials and furnishings that are easily maintained and replaced. Maximize use of daylighting. Provide interior surfaces that are easy to clean and light in color. Design headquarters building with an office ambience.

3.4.4.1. Not Used

3.4.4.2. Bulletin Boards: In the headquarters building provide one bulletin board near the main entrance. Each bulletin board shall be 4 feet high and 6 feet wide and shall have a header panel and lockable, glazed doors.

3.4.4.3. Corner Guards: Provide surface mounted, high impact resistant, integral color, snap-on type resilient corner guards, extending from floor to ceiling for wall and column outside corners in high traffic areas. Factory fabricated end closure caps shall be furnished for top and bottom of surface mounted corner guards.

3.4.4.4. Chair Rail: Chair rails shall be installed in areas prone to hi-impact use, such as corridors and lobby seating areas.

3.4.4.5. Casework: Provide cabinets complying with Architectural Woodwork Institute Quality Standards. Countertops shall have waterfall front edge and integral coved backsplash.

3.4.4.6. Window Treatment: Provide horizontal mini blinds at all exterior windows. Uniformity of window covering color and material shall be maintained to the maximum extent possible throughout each building.

3.4.4.7. Toilet Accessories: Furnish and install the items listed below and all other toilet accessories necessary for a complete and usable facility. All toilet accessories shall be Type 304 stainless steel with satin finish.

(a) Toilets/Showers: Accessories shall include the following items.

- Glass mirrors on stainless steel frame and shelf – at each lavatory
- Hands free liquid soap dispenser – at each lavatory
- Hands free paper towel dispenser at each lavatory/toilet area
- Waste receptacle – recessed mounted at each lavatory/toilet area
- Sanitary napkin disposal at each female toilet
- Toilet paper dispenser – lockable multiple roll at each toilet
- Sanitary toilet seat cover dispenser – at each toilet stall
- Grab bars – as required by ADA
- Shower curtain rod - extra heavy duty
- Shower curtain – white anti-bacterial nylon/vinyl fabric shower curtain
- Soap dish – in shower
- Robe hook – adjacent to shower enclosure entry

(b) Not Used

3.4.4.8. Fire Extinguisher Cabinets and Fire Extinguisher Mounting Brackets: Furnish and install fire extinguisher cabinets and fire extinguisher Mounting brackets as required by applicable codes and criteria. Furnish a list of installed fire extinguisher cabinets and mounting brackets (including location, size and type) to the Contracting Office Representative.

(a) Toilets/Showers: Accessories shall include the following items.

- Glass mirrors on stainless steel frame and shelf – at each lavatory
- Hands free liquid soap dispenser – at each lavatory
- Hands free paper towel dispenser at each lavatory/toilet area
- Waste receptacle – recessed mounted at each lavatory/toilet area
- Sanitary napkin disposal at each female toilet
- Toilet paper dispenser – lockable multiple roll at each toilet
- Sanitary toilet seat cover dispenser – at each toilet stall
- Grab bars – as required by ADA
- Shower curtain rod - extra heavy duty
- Shower curtain – white anti-bacterial nylon/vinyl fabric shower curtain
- Soap dish – in shower
- Robe hook – adjacent to shower enclosure entry

(b) Not Used

3.4.5. Finishes

3.4.5.1. Paint

(a) All paints used shall be listed on the "Approved Product List" of the Master Painters Institute (MPI). Application criteria shall be as recommended by MPI guide specifications for the substrate to be painted and the environmental conditions existing at the project site.

(b) Exterior surfaces, except factory pre-finished material or exterior surfaces receiving other finishes shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Exterior paints and coating products shall be classified as containing low volatile organic compounds (VOCs) in accordance with MPI criteria. Application criteria shall be as recommended by MPI guide specifications. Provide an MPI Gloss Level 5 Finish (semi-gloss), unless otherwise specified.

(c) Interior surfaces, except factory pre-finished material or interior surfaces receiving other finishes, shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Interior paints and coating products shall contain a maximum level of 150 grams per liter (g/l) of VOCs for non-flat coatings and 50 g/l of VOCs for flat coatings. Provide an MPI Gloss Level 5 Finish (semi-gloss) in wet areas and a flat finish in all other areas.

3.4.5.2. Minimum Interior Finishes-General

(a) Designers are not limited to finishes listed in the following INTERIOR FINISHES table(s) and are encouraged to offer higher quality finishes.

(b) Wall, ceiling and floor finishes and movable partitions shall conform to the requirements of the IBC, NFPA and UFC 3-600-01 Fire Protection Engineering for Facilities. Where code requirements conflict, the most stringent code requirement shall apply.

(c) Carpet shall be minimum of 2 yarn ply, modular tile conforming to ISO 2551, ASTM D 418, ASTM D 5793, ASTM D 5848, solution dyed, tufted, cut and loop pile, commercial 100% branded (federally registered trademark) nylon continuous filament. Vinyl composition tile (VCT) shall be minimum 1/8 inch thick, conforming to ASTM F 1066, Class 2, through pattern tile, Composition 1, asbestos free, with color and pattern uniformly distributed throughout the thickness of the tile.

(d) Walls: All wall finish shall be minimum 5/8” painted gypsum board, except where stated otherwise. All gypsum board shall achieve a score of 10, the highest level of performance for mold resistance under the ASTM D 3273 test method. All gypsum board shall be transported, handled, stored and installed in accordance with the GYPSUM ASSOCIATION – Guidelines For Prevention Of Mold Growth On Gypsum Board (GA-238-03). Use impact resistant gypsum board in corridors, storage rooms, stairwells and activity rooms and centralized laundries (if centralized laundries are required by RFP).

(e) All ceiling finishes shall be minimum 5/8” painted gypsum board, except where stated otherwise. All gypsum board shall achieve a score of 10, the highest level of performance for mold resistance under the ASTM D 3273 test method. All gypsum board shall be transported, handled, stored and installed in accordance with the GYPSUM ASSOCIATION – Guidelines For Prevention Of Mold Growth On Gypsum Board (GA-238-03).

3.4.5.3. Not Used

3.4.5.4. BNHQ Interior Finishes

BNHQ MINIMUM INTERIOR FINISHES

	FLOORS					BASE		WALLS		CEILING			REMARKS
	RESILIENT FLOORING	PORCELAIN OR QUARRY TILE	CERAMIC TILE	RECESSED ENTRY MAT	SEALED CONCRETE	RESILIENT BASE	CERAMIC BASE	PAINT	CERAMIC	GYPSUM WALLBOARD	ACOUSTICAL CEILING TILE	MINIMUM HEIGHT	
Mechanical					●	●		●		●		-	
Electrical					●	●		●		●		-	
Communications					●	●		●		●		10'-0"	
Janitor			●				●	●	●	●		8'-0"	SEE NOTE 2
Classrooms	●					●		●		●		8’-0”	
Instructor Workspace	●					●		●		●		8’-0”	
Men's Restroom			●				●	●	●	●		8'-0"	

Women's Restroom			•				•	•	•	•		8'-0"	
Vending:	•					•		•		•		8'-0"	SEE NOTE 1
Chaplain	•					•		•		•		8'-0"	
Chaplain Assistant	•					•		•		•		8'-0"	
Lobby	•					•		•		•		9'-0"	
Corridor	•					•		•		•		9'-0"	
Duty Officer	•					•		•		•		8'-0"	
Message Center	•					•		•		•		8'-0"	
S-2 office	•					•		•		•		8'-0"	
Intelligence Work Spaces	•					•		•		•		8'-0"	
Classified Document Storage	•					•		•		•		8'-0"	
S-3 Office	•					•		•		•		8'-0"	
Training and Operations Work Spaces	•					•		•		•		8'-0"	
S-4 office	•					•		•		•		8'-0"	
Supply and Logistics Work Spaces	•					•		•		•		8'-0"	
Personnel and Administrative Work Spaces	•					•		•		•		8'-0"	
S-1 office	•					•		•		•		8'-0"	
BN XO	•					•		•		•		8'-0"	
SGT MJR	•					•		•		•		8'-0"	
BN CO	•					•		•		•		8'-0"	
Supply Storage	•					•		•		•		8'-0"	
Toilet			•				•	•	•	•		8'-0"	
Break Area	•					•		•		•		8'-0"	
Conference Room	•					•		•		•		8'-0"	
1. FLOOR IN VENDING OR RECYCLABLES STORAGE AREA, MATCH ADJACENT FLOORING, WALL, AND CEILING FINISHES													
2. ALL WET WALLS SHALL HAVE A 4'-0" HIGH CERAMIC TILE WAINSCOT OR FULL HEIGHT TILE WALLS													
3. ALL COUNTERS SHALL HAVE A MINIMUM OF 4" HIGH BACKSPLASH													
4. STAIR LANDING SHALL BE RESILIENT FLOORING OR SEALED CONCRETE, TREADS SHALL BE RESILIENT OR SEALED CONCRETE, PROVIDE SLIP RESISTANT NOSING, RISERS SHALL BE PAINTED STEEL													

3.4.5.5. Not Used

3.4.5.6. Not Used

3.4.5.7. Not Used

3.4.5.8. Not Used

3.4.5.9. BNHQ Furniture Chart

BNHQ FURNITURE CHART		
Description	**Comments**	**Furniture Required**
Battalion Commander	Private Office	L-shaped executive desk with two pedestals, two 4-drawer lateral files, one conference table, four conference chairs, two guest chairs, one executive chair
Executive Office (XO, CMD SGT MAJ)	Private Office	L-shaped executive desk with two pedestals, one double pedestal credenza, hutch, two 4-drawer lateral files, two guest chairs, one managerial chair
Office 1 (S-1, S-2, S-3, S-4)	Private Office	L-shaped executive desk with two pedestals, one double pedestal credenza, hutch, one 4-drawer lateral file, two guest chairs, one managerial chair

BNHQ FURNITURE CHART		
Description	**Comments**	**Furniture Required**
Office 2 (Chaplain)	Private Office	L-shaped executive desk with two pedestals, one double pedestal credenza, hutch, one 4-drawer lateral file, one guest chair, one 3-seat upholstered arrangement, one managerial chair
Office 3 (Chaplain Asst)	Office	L-shaped desk with two pedestals, two 4-drawer lateral files, two guest chairs, one task chair
Personnel and Admin	48 NSF Open Workstations	Nine (9) Systems furniture workstations with work surface, file pedestals, and overhead storage, two 4-drawer lateral files per workstation, one guest chair and one task chair per workstation
Training and Operations Area	48 NSF Open Workstations	Three (3) Systems furniture workstations with work surface, file pedestals, and overhead storage, two 4-drawer lateral files per workstation, one guest chair and one task chair per workstation
Supply and Logistics	48 NSF Open Workstations	Two (2) Systems furniture workstations with work surface, file pedestals, and overhead storage, two 4-drawer lateral files per workstation, one guest chair and one task chair per workstation
Instructor Work Space	48 NSF Open Workstations	Three (3) Systems furniture workstations with work surface, file pedestals, and overhead storage, two 4-drawer lateral files per workstation, one guest chair and one task chair per workstation
Intelligence Area	48 NSF Open Workstations	Three (3) Systems furniture workstations with work surface, file pedestals, and overhead storage, two 4-drawer lateral files per workstation, one guest chair and one task chair per workstation, four 4-drawer safes.
Executive Reception (Personnel and Admin)	Reception Desk	Reception furniture workstation with work surfaces, transaction top, file pedestals, and overhead storage, one task chair, four reception chairs, one side table
Classroom	Multi-Purpose	200 tablet-arm chair desks, movable partitions to divide large classroom space into three equally-sized spaces
Conference Room	Commander's Conference Room	Boat-shape12 eight side chairs, one small storage credenza
Lobby	Waiting Area	Six guest chairs, two side tables
Duty Officer	Reception Desk	One task chair, one 4-drawer lateral file
Message Mail Center	Mail Room	One single pedestal desk, two task chairs, one mail sorter for four companies
Supply Storage	Storage	Two lockable storage cabinets

3.4.5.10. Not Used

3.5. STRUCTURAL REQUIREMENTS

Design and construct as a complete system in accordance with APPLICABLE CRITERIA.

3.5.1. Live Loads: Design live loads shall be per the IBC but not lower than the following minimums.

(a) Elevated slabs 60 pounds per square foot (psf)

(b) Slab on grade 150 psf

(c) Centralized laundry area 150 psf, but not less than actual equipment loads.

3.6. COMPLIANCE WITH THE ENERGY POLICY ACT OF 2005 (EPACT 2005)

3.6.1. The building, including the building envelope, HVAC systems, service water heating, power, and lighting systems shall be designed to achieve an energy consumption that is at least 30% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90 (see paragraph 5.9 Energy Conservation)

3.6.2. Not Used

3.7. MECHANICAL REQUIREMENTS

3.7.1. Plumbing

3.7.1.1. Not Used

3.7.1.2. Not Used

3.7.1.3. Not Used

3.7.2. Heating, Ventilating and Air-Conditioning (HVAC)

3.7.2.1. Not Used

3.7.2.2. Not Used

3.7.2.3. Not Used

3.7.2.4. Not Used

3.7.2.5. In headquarters building all air handling units shall be located in mechanical rooms accessible only through an exterior door. Mechanical rooms shall be sized for ease of service, maintenance, and replacement of HVAC equipment. Air filters shall be located in the mechanical room.

Each conference room and classroom shall be zoned separately. Other space zoning shall be based on exterior envelope exposures. Where VAV systems are used, limit individual zones to a maximum of 2,500 cfm.

Air handling units shall run continuously during occupied hours. Similarly, outdoor ventilation air required by ASHRAE 62.1 shall be continuous during occupied hours.

3.7.2.6. Not Used

3.7.3. Fire Protection

Fire suppression systems shall be designed in accordance with the latest edition of UFC 3-600-01.

3.8. ELECTRICAL AND TELECOMMUNICATIONS REQUIREMENTS

Select electrical characteristics of the power system to provide a safe, efficient, and economical distribution of power based upon the size and types of loads to be served. Use distribution and utilization voltages of the highest level that is practical for the load to be served. The effect of nonlinear loads such as computers, other electronic equipment and electronic ballasts shall be considered and accommodated as necessary. Transient voltage surge protection shall be provided for B/COFs, BNHQs and BDEHQs.

3.8.1. Power outlets

Power shall be provided for all installed equipment requiring power including all government furnished contractor installed equipment and all GFGI equipment. Power poles are not allowed. The following shall also be provided.

3.8.1.1. Provide 125-volt duplex receptacles per NFPA 70 in conjunction with the proposed equipment and furniture layouts, and as per other stated requirements elsewhere in the RFP.

3.8.1.2. In addition to receptacles required elsewhere in the RFP provide one 125-volt duplex receptacle per wall in all normally occupied spaces.

3.8.1.3. For housekeeping purposes provide a minimum of one 125-volt, duplex receptacle per corridor and a minimum of one 125-volt duplex receptacle on each wall within the lobby. No point along bottom of corridor or lobby walls shall be more than 25 feet from a receptacle.

3.8.1.4. Provide 125-volt duplex receptacles mounted adjacent to lavatories. Provide a minimum of one for every two adjacent lavatories. Each single lavatory shall also be provided a receptacle.

3.8.1.5. Provide a minimum of two 125-volt, duplex receptacles in each mechanical room in addition to NFPA 70 requirements. In addition, provide a minimum of one 125-duplex receptacle in each electrical room.

3.8.1.6. Provide a 125-volt quadraplex receptacle on a dedicated circuit for the CQ station.

3.8.2. Grounding

Grounding shall be provided in accordance with NFPA 70 and the Technical Criteria for I3A. In addition raised flooring shall be grounded to the building's primary grounding electrode.

3.8.3. Lighting

Interior lighting controls shall be provided in accordance with ASHRAE 90.1. Local manual controls shall supplement automatic controls in offices, large open work spaces,; and specialized areas such as, conference rooms, Compact fluorescent lamps of 12 watts or less shall not be used. Electronic ballasts for linear fluorescent lamps shall be the high efficiency programmed start type Provided lighting levels shall be within +/- 10% of required lighting levels.

3.8.3.1. Not Used

3.8.3.2. Not Used

3.8.3.3. Not Used

3.8.3.4. Mechanical rooms, , supply rooms and electrical rooms shall be illuminated to a level of 30 foot-candles.

3.8.3.5. Lobby in headquarters building(s) shall be illuminated to a level of 20 foot-candles.

3.8.3.6. Lighting shall be compatible with security cameras and security requirements.

3.8.4. Telecommunications System

Telecommunication outlets shall be provided per the applicable criteria based on functional purpose of the space within the building and in accordance with other provisions of this RFP.

3.8.4.1. Provide voice and data connection capability to all workstations.

3.8.4.2. Not Used

3.8.4.3. Not Used

3.8.4.4. Provide a dual (voice and data) 8-pin modular jack outlet at the front of each partitioned area in each classroom and .

3.8.5. Video Teleconferencing

3.8.5.1. Not Used

3.8.5.2. Provide a dual (fiber optic and 8-pin modular) jack outlet for video teleconferencing connectivity in each classroom and conference room.

3.8.5.3. Not Used

3.8.6. Not Used

3.8.6.1. An Intrusion Detection System (IDS) shall be provided for each SIPRNET room. Provide a control panel, balanced magnetic switch, motion sensor, and duress switch unless specified otherwise in paragraph 6. System requirements shall be coordinated with the Installation.

3.8.7. CATV

All CATV outlet boxes, connectors, cabling, and cabinets shall conform to the Technical Criteria for I3A unless noted otherwise. All horizontal cabling shall be homerun from the CATV outlet to the nearest telecommunications room. See paragraph 6.0 PROJECT SPECIFIC REQUIREMENTS for possible additional requirements.

3.8.7.1. Not Used

3.8.7.2. Not Used

3.8.8. Secure Telecommunications

Space shall be provided in the form of a six foot by six foot room, adjacent to the main telecommunications equipment room for future Secret Internet Protocol Router Network (SIPRNET) connectivity to include secure video teleconferencing. The SIPRNET room shall be designed and constructed in accordance with AR 380-5, Department of the Army Information Security Program. and in accordance with paragraph 6.3.4.3 of the technical Guide for the Integration of the SIPRNET.

3.8.9. Paging System

A zoned paging system shall be provided throughout the facility and integrated with the telephone system. System may utilize mass notification amplifiers and speakers, but shall be overridden by the mass notification system if mass notification system is activated while the paging system is being utilized. System shall have a minimum capacity of eight zones. Facility shall be zoned per user requirements.

3.8.10. Security Infrastructure (Security Equipment Not in Contract)

The security infrastructure shall be installed to support Government furnished equipment including cameras, door alarms, and motion sensors. These devices will be utilized at all exterior entrances with the exception of utility room entrances. Infrastructure shall consist of conduit, pull wire and outlet boxes per user requirements. Conduits shall be homerun from outlet boxes for equipment connection to duty officer room.

3.8.11. Audio/Visual System

3.8.12. Provide an empty 1” conduit (with pull wire) above the ceiling from each GFGI ceiling mounted projector location to a wall mounted outlet box at the front of each classroom and conference room.

3.8.13. Not Used

3.9. FIRE ALARM REQUIREMENTS

3.9.1. All software, software locks, special tools and any other proprietary equipment required to maintain, add devices to or delete devices from the system, or test the Fire Alarm system shall become property of the Government and be furnished to the Contracting Officer’s Representative prior to final inspection of the system.

3.9.2. The fire alarm system installion shall be supervised by a National Institute for Certification of Engineering Technologies (NICET) 3 (minimum) technician.

3.9.3. Not Used

4.0 APPLICABLE CRITERIA

Unless a specific document version or date is indicated, use criteria from the most current references as of the date of issue of the contract or task order, including any applicable addenda, unless otherwise stated in the task order. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

Table 1: Industry Criteria

Air Conditioning and Refrigeration Institute (ARI)	
ARI 310/380	Packaged Terminal Air-Conditioners and Heat Pumps
ARI 440	Room Fan-Coil and Unit Ventilator
ANSI/ARI 430-99	Central Station Air Handling Units
ARI 445	Room Air-Induction Units
ARI 880	Air Terminals
Air Movement and Control Association (AMCA)	
AMCA 210	Laboratory Methods of Testing Fans for Rating
American Architectural Manufacturers Association (AAMA)	
AAMA 605	Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 607.1	Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
AAMA 1503	Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
American Association of State Highway and Transportation Officials (AASHTO)	
	Roadside Design Guide [guardrails, roadside safety devices]
	Standard Specifications for Transportation Materials and Methods of Sampling and Testing [Road Construction Materials]

	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
	Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide]
	A Policy of Geometric Design of Highways and Streets
American Bearing Manufacturers Association (AFBMA)	
AFBMA Std. 9	Load Ratings and Fatigue Life for Ball Bearings
AFBMA Std. 11	Load Ratings and Fatigue Life for Roller Bearings
American Boiler Manufacturers Association (ABMA)	
ABMA ISEI	Industry Standards and Engineering Information
American Concrete Institute	
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI SP-66	ACI Detailing Manual
ACI 530	Building Code Requirements for Masonry Structures
ADA Standards for Accessible Design	
See US Access Board	ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10.
American Institute of Steel Construction (AISC)	
	Manual of Steel Construction – 13th Edition (or latest version)
American Iron and Steel Institute	
AISI S100	North American Specification for the Design of Cold-Formed Steel Structural Members
American National Standards Institute 11 (ANSI)	

ANSI Z21.10.1	Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less
ANSI Z124.3	American National Standard for Plastic Lavatories
ANSI Z124.6	Plastic Sinks
ANSI Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
ANSI/IEEE C2-2007	National Electrical Safety Code
ANSI/AF&PA NDS-2001	National Design Specification for Wood Construction
American Society of Civil Engineers (ASCE)	
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 37	Design and Construction of Sanitary and Storm Sewers, Manuals and Reports on Engineering Practice [sanitary sewer and storm drain design criteria]
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation]
ASCE/SEI 41-06	Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation]
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)	
ASHRAE 90.1	ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASHRAE Guideline 1.1	The HVAC Commissioning Process
ASHRAE Handbooks	Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified)
ASHRAE Standard 15	Safety Standard for Refrigeration Systems
ASHRAE Standard 62.1	Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 55	Thermal Environmental Conditions for Human Occupancy

American Society of Mechanical Engineers International (ASME)	
ASME BPVC SEC VII	Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers
ASME A17.1	Safety Code for Elevators and Escalators
ASME B 31 (Series)	Piping Codes
American Water Works Association (AWWA)	
	Standards [standards for water line materials and construction]
American Welding Society	
	Welding Handbook
	Welding Codes and Specifications (as applicable to application, see International Building Code for example)
Architectural Woodwork Institute (AWI)	
Version 1.2	AWI Quality Standards 7th Edition
Associated Air Balance Council (AABC)	
AABC MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems
	AABC Associated Air Balance Council Testing and Balance Procedures
ASTM International	
ASTM C1060-90(1997)	Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM E 779 (2003)	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1827-96(2002)	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
Builders Hardware Manufacturers Association (BHMA)	
ANSI/BHMA	American National Standards for Builders Hardware

Building Industry Consulting Service International	
	Telecommunications Distribution Methods Manual (TDMM)
	Customer-Owned Outside Plant Design Manual (CO-OSP)
Code of Federal Regulations (CFR)	
49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
10 CFR 430	Energy Conservation Program for Consumer Products
Consumer Electronics Association	
CEA 709.1B	Control Network Protocol Specification
CEA 709.3	Free-Topology Twisted-Pair Channel Specification
CEA 852	Tunneling Component Network Protocols Over Internet Protocol Channels
Electronic Industries Association (EIA)	
ANSI/EIA/TIA 568	Structured Cabling Series
ANSI/EIA/TIA 569	Commercial Building Standard for Telecommunications Pathways and Spaces (includes ADDENDA)
ANSI/TIA/EIA-606	Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
J-STD EIA/TIA 607	Commercial Building Grounding and Bonding Requirements for Telecommunications
Federal Highway Administration (FHWA)	
	Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways]
FHWA-NHI-01-021	Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL
Illuminating Engineering Society of North America (IESNA)	
IESNA RP-1	Office Lighting

IESNA RP-8	Roadway Lighting
IESNA Lighting Handbook	Reference and Application
Institute of Electrical and Electronics Engineers Inc. (IEEE)	
	Standard for Use of the International System of Units (SI): the Modern Metric System
Standard 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
International Code Council (ICC)	
IBC	International Building Code Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70. All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58. All references in the International Building Code to the International Fire Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01.
IMC	International Mechanical Code – Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1 Note: For all references to “VENTILATION”, follow ASHRAE 62.1
IRC	International Residential Code
IPC	International Plumbing Code
IEC	Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements.
IGC	International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquified Petroleum Gas Code.
International Organization for Standardization (ISO)	
ISO 6781:1983	Qualitative detection of thermal irregularities in building envelopes –

	infrared method
LonMark International (LonMark)	
LonMark Interoperability Guidelines	(available at www.lonmark.org), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide
LonMark Resource Files	(available at www.lonmark.org), including Standard Network Variable Type (SNVT) definitions
Metal Building Manufacturers Association (MBMA)	
	Metal Building Systems Manual
Midwest Insulation Contractors Association (MICA)	
	National Commercial and Industrial Insulation Standards Manual
National Association of Corrosion Engineers International (NACE)	
NACE RP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0185	Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe
NACE RP0285	Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
NACE RP0286	Electrical Isolation of Cathodically Protected Pipelines
National Electrical Manufacturers Association (NEMA)	
National Environmental Balancing Bureau (NEBB)	
	Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems
National Fire Protection Association (NFPA)	
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Installation of Sprinkler Systems
NFPA 13R	Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems

NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 20	Installation of Centrifugal Fire Pumps
NFPA 24 NFPA 25	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design] Inspection, Testing And Maintenance Of Water-Based Fire Protection Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Motor Fuel Dispensing Facilities and Repair Garages
NFPA 31	Installation of Oil Burning Equipment
NFPA 54	National Fuel Gas Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 76	Fire Protection of Telecommunications Facilities
NFPA 80	Standard for Fire Doors and Fire Windows
NFPA 90a	Installation of Air Conditioning and Ventilating Systems
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
National Roofing Contractor's Association (NRCA)	
	Roofing and Waterproofing Manual
National Sanitation Foundation, International	
NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59,	Food Equipment Standards

169	
ANSI/UL Std. 73, 197, 471, 621, 763	Food Equipment Standards
CSA Std. C22.2 No. 109, 120, 195	Food Equipment Standards
Occupational Safety and Health Administration (OSHA)	
Title 29, Part 1926	OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction
Plumbing and Drainage Institute (PDI)	
PDI G 101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH201	Water Hammer Arrestors
Precast Concrete Institute	
PCI Design Handbook	Precast and Prestressed Concrete
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)	
SMACNA HVAC Duct Construction Standards	HVAC Duct Construction Standards - Metal and Flexible
SMACNA Architectural Manual	Architectural Sheet Metal Manual
SMACNA HVAC TAB	HVAC Systems - Testing, Adjusting and Balancing
State/Local Regulations	
	State Department of Transportation Standard Specifications for Highway and Bridge Construction
	Sedimentation and Erosion Control Design Requirements
	Environmental Control Requirements
	Storm Water Management Requirements
Steel Door Institute (SDI)	

ANSI A250.8/SDI 100	Standard Steel Doors and Frames
Steel Deck Institute	
	SDI Diaphragm Design Manual
Steel Joist Institute	
	Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders
Underwriters Laboratories (UL)	
UL 96A	Installation Requirements for Lightning Protection Systems
UL 300	Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas
UNITED STATES ACCESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD	
ADA and ABA Accessibility Guidelines for Buildings and Facilities	ABA Accessibility Standard for DoD Facilities Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10. Use this reference in lieu of IBC Chapter 11. Excluded are: (a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion). (b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion).
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES	
	FDA National Food Code
U.S. GREEN BUILDING COUNCIL (USGBC)	
LEED-NC	Green Building Rating System for New Construction & Major Renovations
	Application Guide for Multiple Buildings and On-Campus Building Projects

4.2. MILITARY CRITERIA

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)

4.2.2. Executive Order 12770: Metric Usage In Federal Government

(a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.

4.2.3. TB MED 530: Occupational and Environmental Health Food Sanitation

4.2.4. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning - applicable only to the extent specified in paragraph 5, herein.

4.2.5. Deleted.

4.2.6. UFC 3-600-01 Design: Fire Protection Engineering for Facilities. Use the latest edition of the IBC in coordination with this UFC. Use Chapters 3, 6, 7, 33 and UFC 3-600-01. If any conflict occurs between these Chapters and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence. Use UFC 3-600-01 in lieu of IBC Chapters 4, 8,9,10.

4.2.7. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

4.2.8. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse (Use most recent version, regardless of references thereto in other publications)

(a) Note the option to use tie force method or alternate path design for Occupancy Category II.

4.2.9. UFC 4-021-01 Design and O&M: Mass Notification Systems

4.2.10. Technical Criteria for Installation Information Infrastructure Architecture (I3A)

(a) Email: DetrickISECI3Aguide@conus.army.mil

4.2.11. U.S. Army Information Systems Engineering Command (USAISEC) TG for the Integration of SECRET Internet Protocol (IP) Router Network (SIPRNET). See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.

5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains general technical requirements. See also Paragraph 3 for facility-specific technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed.

5.1. SITE PLANNING AND DESIGN

5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.

5.1.2. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See paragraph 3 for additional site planning requirements relating to building functions.

5.1.2.1. Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.

5.1.2.2. Where included in the project, dumpster pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.

5.1.2.3. Vehicular Circulation. Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational – privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.

5.1.2.4. Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.

5.1.2.5. Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible. Protect trees to be saved during the construction process from equipment.

5.1.2.6. Stormwater Management. Employ design and construction strategies (Best Management Practices) that reduce stormwater runoff, reduce discharges of polluted water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume and duration of flow to the maximum extent practicable. See paragraph 6, PROJECT SPECIFIC requirements for additional information.

5.1.3. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy.

5.1.4. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.

5.2. SITE ENGINEERING

5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.

5.2.2. SOILS:

5.2.2.1. A report has been prepared to characterize the subsurface conditions at the project site and is **appended to these specifications.** The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.

5.2.2.2. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.

5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

5.2.3.1. Design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectance of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices.

5.2.3.2. Parking Requirements.

(a) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.

(b) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.

5.2.3.3. Sidewalks. Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable.

5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.

5.2.5. UTILITIES: See paragraph 6.4.6 for specific information on ownership of utilities and utility requirements. Meter all utilities (gas, water, and electric, as applicable) to each facility. For Government owned utilities, install meters that are wireless data transmission capable as well as have a continuous manual reading option. All meters will be capable of at least hourly data logging and transmission and provide consumption data for gas, water, and electricity. Gas and electric meters will also provide demand readings based on consumption over a maximum of

any 15 minute period. Configure all meters to transmit at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation.

5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

5.2.7. IRRIGATION. Landscape irrigation systems, if provided, shall comply with the following:

5.2.7.1. Irrigation Potable Water Use Reduction. Reduce irrigation potable water use by 100 percent using LEED credit WE1.1 baseline (no potable water used for irrigation), except where precluded by other project requirements.

5.2.8. EPA WaterSense Products and Contractors. Except where precluded by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.

5.3. ARCHITECTURE AND INTERIOR DESIGN:

This element will be evaluated per APPLICABLE CRITERIA under the quality focus.

5.3.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.

5.3.2. GENERAL: Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.

5.3.3. COMPUTATION OF AREAS: See APPENDIX Q for how to compute gross and net areas of the facility(ies).

5.3.4. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Exterior colors shall conform to the Installation requirements. See paragraph 6.

5.3.4.1. Building Numbers: Each building shall have exterior signage permanently attached on two faces of the building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage.

5.3.5. BUILDING INTERIOR

5.3.5.1. Space Configuration: Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

5.3.5.2. Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

5.3.5.3. Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordination of the building colors and finishes is necessary for a cohesive design. Color selections shall be appropriate for the building type. The use of color, texture and pattern shall be used to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Finishes should be selected with regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Color of Ceramic and porcelain tile grout shall be medium range color to help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items shall be coordinated with the building interior. Color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) shall match the ceiling color.

5.3.5.4. Circulation: Circulation schemes must support easy way finding within the building.

5.3.5.5. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.

5.3.5.6. Window Treatment: Interior window treatments with adjustable control shall be provided in all exterior window locations for control of day light coming in windows or privacy at night. Uniformity of treatment color and material shall be maintained to the maximum extent possible within a building.

5.3.6. COMPREHENSIVE INTERIOR DESIGN

5.3.6.1. Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building's interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package includes finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. See Section 01 33 16 for SID design procedures.

The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package includes the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. Coordinate the selection of furniture style, function and configuration with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection include function and ergonomics, maintenance, durability, sustainability, comfort and cost. See Section 01 33 16 for FFE design procedures.

5.4. STRUCTURAL DESIGN

5.4.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.

5.4.2. GENERAL: The structural system needs to be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.

5.4.3. LOADS: See paragraph 3 for facility specific (if applicable) and paragraph 6 for site and project specific structural loading criteria. Unless otherwise specified in paragraph 6, use Exposure Category C for wind. If not specified, use Category C unless the Designer of Record can satisfactorily justify another Exposure Category in its design analysis based on the facility Master Plan. Submit such exceptions for approval as early as possible and prior to the Interim Design Submittal in Section "Design After Award"

5.4.4. TERMITE TREATMENT: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm.

5.5. THERMAL PERFORMANCE

5.5.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.

5.5.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT. Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings.

5.5.2.1. Trace a continuous plane of air-tightness throughout the building envelope and make flexible and seal all moving joints.

5.5.2.2. The air barrier material(s) must have an air permeance not to exceed 0.004 cfm / sf at 0.3” wg (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178

5.5.2.3. Join and seal the air barrier material of each assembly in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components.

5.5.2.4. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement, or damage, and transfer the load to the structure.

5.5.2.5. Seal all penetrations of the air barrier. If any unavoidable penetrations of the air barrier by electrical boxes, plumbing fixture boxes, and other assemblies are not airtight, make them airtight by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly.

5.5.2.6. The air barrier must be durable to last the anticipated service life of the assembly.

5.5.2.7. Do not install lighting fixtures with ventilation holes through the air barrier

5.5.2.8. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers such as at elevator shafts.

5.5.2.9. Damper and control to close all ventilation or make-up air intakes and exhausts, atrium smoke exhausts and intakes, etc when leakage can occur during inactive periods.

5.5.2.10. Compartmentalize garages under buildings by providing air-tight vestibules at building access points.

5.5.2.11. Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.

5.5.2.12. Performance Criteria and Substantiation: Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:

(a) Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.25cfm/ft2 at a pressure differential of 0.3” w.g.(75 Pa) in accordance with ASTM’s E 779 (2003) or E-1827-96 (2002). Accomplish tests using either pressurization or depressurization or both. Divide the volume of air leakage in cfm @ 0.3” w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft2 @ 0.3” w.g. (L/s.m2 @ 75 Pa). Do not test the building until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions so that repairs to the continuous air barrier, if needed to comply with the required air leakage rate, can be done in a timely manner.

(b) Test the completed building using Infrared Thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060-90(1997). Determine air leakage pathways using ASTM E 1186-03 Standard Practices for Air Leakage Site

Detection in Building Envelopes and Air Barrier Systems, and perform corrective work as necessary to achieve the whole building air leakage rate specified in (a) above.

(c) Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

5.6. PLUMBING

5.6.1. STANDARDS AND CODES: The plumbing system shall conform to APPLICABLE CRITERIA.

5.6.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, the design for underslab piping systems and underground piping serving chillers, cooling towers, etc, shall include features to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, piping should be suspended from the structure with adequate space provided below the pipe for the anticipated soil movement.

5.6.3. HOT WATER SYSTEMS: For Hot Water heating and supply, provide a minimum temp of 140 Deg F in the storage tank and a maximum of 110 Deg F at the fixture, unless specific appliances or equipment specifically require higher temperature water supply.

5.6.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in paragraph 3, design in accordance with ASHRAE Handbook Series (appropriate Chapters), ASHRAE Standard 90.1, and the energy conservation requirements of the contract. Size and place equipment so that it is easily accessible and removable for repair or replacement.

5.6.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).

5.6.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

5.6.7. URINALS: Urinals shall be vitreous china, wall-mounted, wall outlet, non-water using, with integral drain line connection, and with sealed replaceable cartridge or integral liquid seal trap. Either type shall use a biodegradable liquid to provide the seal and maintain a sanitary and odor-free environment. Install, test and maintain in accordance with manufacturer's recommendations. Slope the sanitary sewer branch line for non-water use urinals a minimum of 1/4 inch per foot. Do not use copper tube or pipe for drain lines that connect to the urinal. Manufacturer shall provide an operating manual and on-site training to installation operations personnel for the proper care and maintenance of the urinal. For complexes, non-water using urinals are not required for barracks type spaces.

5.6.8. BUILDING WATER USE REDUCTION. Reduce building potable water use in each building 30 percent using IPC fixture performance requirements baseline.

5.6.9. Do not use engineered vent or Sovent® type drainage systems.

5.6.10. Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Follow ASHRAE Fundamentals Chapter 23, Insulation for Mechanical Systems, IMC paragraph 1107 and International Energy Conservation Code for pipe insulation requirements.

5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.7.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.

5.7.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.

5.7.3. POWER SERVICE: Primary service from the base electrical distribution system to the pad-mounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.

5.7.3.1. Spare Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.

5.7.4. TELECOMMUNICATION SERVICE: The project's facilities must connect to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.

5.7.5. LIGHTING: Comply with the recommendations of the Illumination Engineering Society of North America (IESNA), the National Energy Policy Act and Energy Star requirements for lighting products..

5.7.5.1. Interior Lighting:

(a) Reflective Surfaces: Coordinate interior architectural space surfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.

(b) High Efficiency Fluorescent Lighting: Utilize NEMA premium electronic ballasts and energy efficient fluorescent lamps with a Correlated Color Temperature (CCT) of 4100K. Linear fluorescent and compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 87 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Do not use surface mounted fixtures on acoustical tile ceilings. Provide an un-switched fixture with emergency ballast shall be provided at each entrance to the building.

(c) Solid State Lighting: Fixtures shall provide lighting with a minimum Correlated Color Temperature (CCT) of 4100K and shall have a Color Rendering Index of (CRI) of 75 or higher. Verify performance of the light producing solid state components by a test report in compliance with the requirements of IESNA LM 80. Verify performance of the solid state light fixtures by a test report in compliance with the requirements of IESNA LM 79. Provide lab results by a NVLAP certified laboratory. The light producing solid state components and drivers shall have a life expectancy of 50,000 operating hours while maintaining at least 70% of original illumination level. Provide a complete five year warranty for fixtures.

(d) Metal Halide Lighting (where applicable): Metal Halide lamp fixtures in the range of 150-500 Watts shall be pulse start type and have a minimum efficiency rating of 88%.

(e) Lighting Controls: ANSI/ASHRAE/IESNA 90.1 has specific lighting controls requirements. Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces (classrooms, conference rooms) to promote the productivity, comfort and well being of the building occupants. In office spaces, the preferred lighting should be a 30 FC ambient lighting level with occupancy sensor controlled task lighting in the work spaces to provide a composite lighting level of 50 FC on the working surfaces. Consider incorporating daylighting techniques for the benefit of reducing lighting energy requirements while improving the quality of the indoor spaces. If daylight strategies are used, additional coordination is required with the architect and mechanical engineer. Additionally, incorporate electric lighting controls to take advantage of the potential energy savings.

(f) Exterior Lighting: See paragraph 6.9 for site specific information, if any, on exterior lighting systems. Minimize light pollution and light trespass by not over lighting and use cutoff type exterior luminaries.

5.7.6. TELECOMMUNICATION SYSTEM: All building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA to include I3A Technical Criteria. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.. Items included

under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.

5.7.6.1. Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569, and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See paragraph 5.8.2.5 for design of environmental systems for Telecommunications Rooms.

5.7.6.2. The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

5.7.6.3. Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.

5.7.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

5.8. HEATING, VENTILATING, AND AIR CONDITIONING

5.8.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.

5.8.2. DESIGN CONDITIONS.

5.8.2.1. Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1. All Buildings with minimum LEED Silver requirement (or better) will earn LEED Credit EQ 7.1, Thermal Comfort-Design.

5.8.2.2. Design systems in geographical areas that meet the definition for high humidity in UFC 3-410-01FA in accordance with the special criteria for humid areas therein.

5.8.2.3. Cooling equipment may be oversized by up to 15 percent to account for recovery from night setforward. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Provide ventilation air from a separate dedicated air handling unit (DOAU) for facilities using multiple single zone fan-coil type HVAC systems. Do not condition outside air through fan coil units. Avoid the use of direct expansion cooling coils in air handling units with constant running fans that handle outside air.

5.8.2.4. Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.

5.8.2.5. Environmental Requirements for Telecommunications Rooms,(including SIPRNET ROOMS, where applicable for specific facility type). Comply with ANSI/EIA/TIA 569 and the I3A.

5.8.2.6. Fire dampers: dynamic type with a dynamic rating suitable for the maximum air velocity and pressure differential to which the damper is subjected. Test each fire damper with the air handling and distribution system running.

5.8.3. BUILDING AUTOMATION SYSTEM. Provide a Building Automation System consisting of a building control network , and integrate the building control network into the UMCS as specified.

The building control network shall be a single complete non-proprietary Direct Digital Control (DDC) system for control of the heating, ventilating and air conditioning (HVAC) systems as specified herein. The building control network shall be an Open implementation of LONWORKS® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

5.8.3.1. The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

(a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.

(b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

5.8.3.2. All DDC Hardware shall:

(a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.

(b) Communicate over the control network via ANSI/EIA 709.1B exclusively.

(c) Communicate with other DDC hardware using only SNVTs

(d) Conform to the LonMark® Interoperability Guidelines.

(e) Be locally powered; link power (over the control network) is not acceptable.

(f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself

(g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.

(h) To the greatest extent practical, not rely on the control network to perform the application..

5.8.3.3. Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.

5.8.3.4. Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.

5.8.3.5. Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.

5.8.3.6. Each scheduled system shall accept a network variable of type SNVT_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.

5.8.3.7. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

5.8.3.8. Not Used

5.8.3.9. Perform all necessary actions needed to fully integrate the building control system. These actions include but are not limited to:

- Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.
- Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852.

5.8.3.10. Provide the following to the Government for review prior to acceptance of the system:

- The latest version of all software and user manuals required to program, configure and operate the system.
- Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
    - Device address and NodeID.
    - Input and Output SNVTs including SNVT Name, Type and Description.
    - Hardware I/O, including Type (AI, AO, BI, BO) and Description.
    - Alarm information including alarm limits and SNVT information.
    - Supervisory control information including SNVTs for trending and overrides.
    - Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at https://eko.usace.army.mil/fa/besc/
- Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses, IP addresses, and network names.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- LONWORKS® Network Services (LNS®) database for the completed system.
- Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

Table 5-1: QC Checklist

5.8.3.11. Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

5.8.3.12. Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

5.8.3.13. Provide training at the project site on the installed building system Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

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5.8.4. TESTING, ADJUSTING AND BALANCING. Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly

as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

5.8.5. COMMISSIONING: Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Enhanced commissioning, in accordance with ASHRAE Guideline 1.1, ASHRAE Guideline 0 and LEED. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. Hire the Commissioning Authority (CA), certified as a CA by AABC, NEBB, or TABB, as described in Guideline 1.1. The CA will be an independent subcontractor to the contractor and not an employee or subcontractor of any other subcontractor on this project. The CA will not have business connections with any other party on the project. The CA will not have any other role or responsibilities outside of commissioning activities. The CA will communicate and report directly to the Government in the execution of the commissioning activities.The Contracting Officer’s Representative will act as the Owner’s representative in performance of duties spelled out under OWNER in Annex F of ASHRAE Guideline 0. All buildings with Minimum LEED Silver (or better) requirement will earn LEED Credit EA3 Enhanced Commissioning.

5.9. ENERGY CONSERVATION

5.9.1. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.2. Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.3. Purchase Energy Star products, except use FEMP designated products where FEMP is applicable to the type product. The term “Energy Star product” means a product that is rated for energy efficiency under an Energy Star program. The term “FEMP designated product” means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

5.9.4. Solar Hot Water Heating. Provide at least 30% of the domestic hot water requirements through solar heating methodologies, unless the results of a Life Cycle Cost Analysis (LCCA) developed utilizing the Building Life Cycle Cost Program (BLCC) which demonstrates that the solar hot water system is not life cycle cost effective in comparison with other hot water heating systems. The type of system will be established during the contract or task order competition and award phase, including submission of an LCCA for government evaluation to justify non-selection of solar hot water heating. The LCCA uses a study period of 25 years and the Appendix K utility cost information. The LCCA shall include life cycle cost comparisons to a baseline system to provide domestic hot water without solar components, analyzing at least three different methodologies for providing solar hot water to compare against the baseline system.

5.9.5. Process Water Conservation. When potable water is used to improve a building’s energy efficiency, employ lifecycle cost effective water conservation measures, except where precluded by other project requirements.

5.9.6. Renewable Energy Features. The Government's goal is to implement on-site renewable energy generation for Government use when lifecycle cost effective. See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.

5.10. FIRE PROTECTION

5.10.1. STANDARDS AND CODES Provide the fire protection system conforming to APPLICABLE CRITERIA.

5.10.2. Inspect and test all fire suppression equipment and systems, fire pumps, fire alarm and detection systems and mass notification systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

5.10.3. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers.

5.10.4. Fire alarm and detection system: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.

5.10.5. Fire Protection Engineer Qualifications: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES**,** the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

5.11. SUSTAINABLE DESIGN

5.11.1. STANDARDS AND CODES: Sustainable design shall conform to APPLICABLE CRITERIA. See paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project. The LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC) applies to all projects. Averaging may be used for LEED compliance as permitted by the AGMBC but is restricted to only those buildings included in this project. Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and BUILDING WATER USE REDUCTION.

5.11.2. LEED RATING, REGISTRATION, VALIDATION AND CERTIFICATION: See Paragraph PROJECT-SPECIFIC REQUIREMENTS for project minimum LEED rating/achievement level, for facilities that are exempt from the minimum LEED rating, for LEED registration and LEED certification requirements and for other project-specific information and requirements.

5.11.2.1. Innovation and Design Credits. LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID credits that require any Owner actions or commitments are acceptable only when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance

5.11.3. OPTIMIZE ENERGY PERFORMANCE. : Project must earn, as a minimum, the points associated with compliance with paragraph ENERGY CONSERVATION. LEED documentation differs from documentation requirements for paragraph ENERGY CONSERVATION and both must be provided. For LEED-NC v2.2 projects you may substitute ASHRAE 90.1 2007 Appendix G in its entirety for ASHRAE 90.1 2004 in accordance with USGBC Credit Interpretation Ruling dated 4/23/2008.

5.11.4. COMMISSIONING. See paragraph 5.8.5 COMMISSIONING for commissioning requirements. USACE templates for the required Basis of Design document and Commissioning Plan documents are available at http://en.sas.usace.army.mil (click on Engineering Criteria) and may be used at Contractor's option.

5.11.5. DAYLIGHTING. Except where precluded by other project requirements, do the following in at least 75 percent of all spaces occupied for critical visual tasks: achieve a 2 percent glazing factor (calculated in accordance with LEED credit EQ8.1) OR earn LEED Daylighting credit, provide appropriate glare control and provide either automatic dimming controls or occupant-accessible manual lighting controls.

5.11.6. LOW-EMITTING MATERIALS. Except where precluded by other project requirements, use materials with low pollutant emissions, including but not limited to composite wood products, adhesives, sealants, interior paints and finishes, carpet systems and furnishings,

5.11.7. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT. Except where precluded by other project requirements, earn LEED credit EQ 3.1 Construction IAQ Management Plan, During Construction and credit EQ 3.2 Construction IAQ Management Plan, Before Occupancy.

5.11.8. RECYCLED CONTENT. In addition to complying with section RECYCLED/RECOVERED MATERIALS, earn LEED credit MR4.1, Recycled Content, 10 percent except where precluded by other project requirements.

5.11.9. BIOBASED AND ENVIRONMENTALLY PREFERABLE PRODUCTS. Except where precluded by other project requirements, use materials with biobased content, materials with rapidly renewable content, FSC certified wood products and products that have a lesser or reduced effect on human health and the environment over their lifecycle to the maximum extent practicable.

5.11.10. FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM (FB4P). The Farm Security and Rural Investment Act (FSRIA) of 2002 required the U.S. Department of Agriculture (USDA) to create procurement preferences for biobased products that are applicable to all federal procurement (to designate products for biobased content). For all designated products that are used in this project, meet USDA biobased content rules for them except use of a designated product with USDA biobased content is not required if the biobased product (a) is not available within a reasonable time, (b) fails to meet performance standard or (c) is available only at an unreasonable price. For biobased content product designations, see http://www.biopreferred.gov/ProposedAndFinalItemDesignations.aspx.

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT: Achievement of 50% diversion, by weight, of all non-hazardous C&D waste debris is required. Reuse of excess soils, recycling of vegetation, alternative daily cover, and wood to energy are not considered diversion in this context, however the Contractor must tracked and report it. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.

5.13. SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.

(a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation

(b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports

(c) Progressive collapse resistance for all facilities 3 stories or higher

(d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)

(e) For facilities with mailrooms (see paragraph 3 for applicability) – mailrooms have separate HVAC systems and are sealed from rest of building

6.0 PROJECT SPECIFIC REQUIREMENTS FORT SILL, OK

6.1. GENERAL

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

6.2. APPROVED DEVIATIONS

The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

6.2.1. Foundations: Due to expansive soil conditions at Ft. Sill, slabs on grade are not permitted. See paragraph 6.6.1.3.

6.2.2. Pressure piping. No Type M for underground pressure pipe will be allowed. See paragraph 6.8.2.

6.3. SITE PLANNING AND DESIGN

6.3.1. General:

6.3.1.1. The layout for conceptual site preparation and approximate grading elevations are shown on the drawings in Appendix J. Design and construct site and facilities within the specific site responsibility area. The Government will provide general site preparation and mass grading including:

(a) Clearing of all bush and vegetation from the site area. The Government will stockpile removed vegetation outside of site area as designated.

(b) Removal of rocks and stones larger than 6-inches in size;

(c) Rough grading to plus or minus 0.3 feet of proposed subgrade elevation (assumed to be finished floor elevations as shown on the infrastructure site plans minus an assumed foundation depth per the rough grading plan, for proposed structures. Maximum allowable variation of the finished floor elevations is plus or minus 0.2 feet. The Contractor is responsible for any additional fill or cut in order to meet the required minimum or maximum finished floor.

(d) The Infrastructure Contractor will perform rough grading. In areas that required fill during the rough grading, general compaction of fills between 95 to 100 percent of maximum density as measured by Standard Proctor with fill being constructed in maximum 8-inch lifts. The D/B Contractor's geotechnical engineer shall verify compaction of final site.

(e) The Contractor is responsible for any specific site preparation required to accommodate the foundation design prepared or proposed by the Contractor.

6.3.1.2. Time and weather conditions may affect the actual condition of the building site(s); therefore, the Contractor shall accept the site(s) as is and be solely responsible for all final site preparation including any excavation (if necessary), placement of select fill (if necessary), and any testing required to accommodate the proposed foundation, as required by the Contractor's final geotechnical report. Confine site preparation operations to the work area defined by the project site plan unless approved by the Government. Do not waste excess soil within the project site plan work area. Deposit at an approved stockpile or as directed by the Government.

6.3.1.3. Site Design. The Government will designate approximate building site locations and related site features within the drawing included in Appendix J. Since finish grades are not specifically established for specific site responsibility areas, establish finish grades and coordinate grading and other site aspects with the Infrastructure Contractor and other Contractors working on other sites. The Contractor is responsible for the shape of the footprint and the building orientation of the proposed facility or facilities on the designated parcel of land (designated as building envelope on the drawings) with respect to adjacent and future facilities shown on the drawings. Coordinate the design with the Infrastructure Contractor, the included drawings and others working on nearby sites. Locate the facility on the respective parcel of land; however, the Government must approve any proposed changes from the layout identified in the RFP and Contractor must coordinate proposed changes with the Infrastructure Contractor. The Infrastructure Contractor is typically responsible for design and installation of the

surrounding walkways, courtyards, gathering areas, site amenities and parking areas within the site constraints as shown on the drawings, except for organizational parking that is associated with such facilities as the Tactical Equipment Maintenance Facilities, as designated on the Site Drawings in Appendix J., which are the responsibility of the Contractor. Connect all utilities from the building to the service connection point, with the exception of natural gas. Coordinate between the Infrastructure Contractor, the drawings and other contractors relating to site, facility design and functionality and utility connections and outages. Coordinate specific utility outages a minimum of 48 hours in advance through the CO.

6.3.1.4. Upon finalizing the building footprint, provide proposed building footprint, site orientation and requests for deviations from the drawings for Government concurrence and coordination, as applicable, with other product lines. The Government will enforce coordination of proposed buildings and finalize the placement of the buildings within the drawings boundaries and finalize associated site grading around the proposed facilities. The Contractor shall coordinate efforts with work by others on adjacent sites. The Government may modify desired building placement within the building envelope, if deemed necessary. The Government will provide survey control benchmarks and monuments within the specific site area. Set finish floor as indicated in the RFP Drawings and at least a minimum of 8-inches higher than predominant exterior grade. Slope exterior finish grade down and away from each building at a minimum of 5% slope for the first 10 feet. Under no circumstances shall any slope exceed 20% unless retaining structures are not feasible.

6.3.1.5. Privately Owned Vehicle (POV) Parking. By Others. Coordinate POV parking requirements with the A/E Integrator, Infrastructure Contractor, and the Contracting Officer.

6.3.1.6. Additional Information

Not Used.

6.3.2. Site Structures and Amenities

Provide one dumpster pad and enclosure per facility. Locate dumpster enclosure per UFC 4-010-01. Dumpster screening, if required, shall be compatible with the building(s) they serve and shall incorporate the concepts of the architectural theme defined in Appendix F. Locate, design and construct dumpster enclosure(s) as directed within the drawings.

6.3.3. Site Functional Requirements:

6.3.3.1. Stormwater Management (SWM) Systems. Storm drainage system design is shown within the drawings at Appendix J. Design any additional storm drain system required by the project. If the Contractor chooses to connect roof drain leaders to the storm water systems, coordinate the location and size for connection of roof drain leaders to the site storm water system with other contractors, as applicable, through the Contracting Officer prior to finalizing building design a minimum of 45 days prior to beginning building construction. The Contractor is responsible for the Storm Water Pollution Prevention Plan (SWPPP) of the entire construction site. Submit site specific SWPPP in accordance with requirements contained in Section 01 57 23 TEMPORARY STORM WATER POLLUTION CONTROL. Make any piping connection from the building to the connection point.

Include all information in the Storm Water Pollution Prevention Plan (SWPPP) required by the Oklahoma Department of Environmental Quality (ODEQ) General Permit OKR10 for storm water discharges from construction activities within the State of Oklahoma. A copy of the OKR10 permit may be found at the following web page: http://www.deq.state.ok.us/WQDnew/stormwater/construction/okr10_final_permit_13_sep_2007

6.3.3.2. Erosion and Sediment Control. The Fort Sill Environmental Division of Public Works oversees the Stormwater Sediment and Erosion Control Management Plan for the Post.

6.3.3.3. Vehicular Circulation.

(a) Design and construct site pavement to provide access for Ft Sill's fire trucks. The turning radius of the ladder truck is 75-feet 6-inches and weight is 30 tons.

(b) See Appendix HH for additional information.

6.4. SITE ENGINEERING

6.4.1. Existing Topographical Conditions. The Government has provided a three dimensional digital topographic and utility survey. Bring any discrepancies which are found in the Government furnished survey to the immediate attention of the Government for clarification. Drawings showing existing conditions are included within Appendix J.

6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

The Final Geotechnical Report should be submitted along with the first foundation design submittal. See paragraph 6.4.2.1 below.

The following supersedes the 1st sentence of paragraph 5.2.2.1: A report that contains raw data for the project site is contained in Appendix A. Borings, a boring location map, and the raw data on the subsurface conditions are included in the referenced appendix.

6.4.2.1. The following supersedes the 4th sentence of paragraph 5.2.2.1: Additional subsurface investigations and laboratory analysis are required to better characterize the site and develop the final design. Perform the investigation and analysis subsequent to award under the direction of a licensed geotechnical engineer.

6.4.3. Fire Flow Tests See Appendix D for results of fire flow tests to use for basis of design for fire flow and domestic water supply requirements.

Appendix D shows the privatized water supply provider's (AWE) model results for the anticipated additional loading to the system and main upgrades.

6.4.4. Pavement Engineering and Traffic Estimates:

No additional requirements.

6.4.5. Traffic Signage and Pavement Markings

Provide all pedestrian and vehicle signage within the BNHQ project limits in accordance with Appendices H and HH.

6.4.6. Base Utility Information

6.4.6.1. Utilities: The Installation's DPW supervises infrastructure and utilities. Most utilities are privatized. Points of contact for utilities and rates are shown in Section 00 73 00 SPECIAL CONTRACT REQUIREMENTS or 00 73 10 TASK ORDER SUPPLEMENTAL CONTRACT REQUIREMENTS, as applicable to this contract or task order. Existing utility services such as potable water, sanitary sewer, electric, natural gas, and COMM are all located near the site such that lengthy utility extensions are not anticipated for this building. Coordinate and plan utilities with the A/E Integrator through the Contracting Officer. The site plan contained in Appendix J provides utility main routing and general orientation for points of connection for each facility. Prior to final design, Verify the locations and sizes of utility services with the A/E Integrator.

(a) Storm Drainage System tie-in points are shown in the drawings at Appendix J. Tie into these systems as appropriate.

(b) Natural Gas distribution lines are shown on drawings at Appendix J. Coordinate point of connection to the facility with the service provider, Oklahoma Natural Gas (ONG), through the CO. The private utility contractor will run Natural gas service, including meter and regulator, to the face of the building.. Connect to the meter and all piping past the meter outlet. The D/B Contractor is not responsible for costs incurred for services provided by the service provider (ONG). Coordinate and provide gas flow and pressure (if different from the standard pressure) requirements with ONG. Coordinate the location of the facility gas connection with the A/E Integrator and ONG and follow ONG's written and diagrammed location requirements, see Appendix . Design and construct the required building service lines and modifications to any distribution lines in accordance with the requirements of ONG. Also see paragraph entitled "Metering Utilities" in this section.

(c) Water mains are shown on the drawings at Appendix J. Coordinate points of connection through the A/E Integrator with the service provider, American Water Enterprises (AWE). The Infrastructure Contractor will provide the potable water service between the main line to the 5-foot line of the building. Provide potable water service from the 5-foot line to the facility and within the building, through a backflow preventer (generally located in the mechanical room). Coordinate with the service provider, AWE through the CO. The Government will provide primary or main water pipe distribution, including the water meter and vault.. Design and construct water service lines from the 5-foot line to the building to meet the utility provider's installation details and specifications. The Government will provide the Post Indicator Valve (PIV) and any bollards required for protection and route the fire water line (separate from the domestic supply) to 5 feet from the building. See Appendix for AWE requirements.

(d) Sanitary Sewer: The Infrastructure Contractor will design and construct the sanitary sewer service line between the sanitary sewer main to 5 feet from the building, including cleanout or manhole. Sanitary sewer mains are shown on the drawings in Appendix J. Coordinate points of connection through the CO with the service provider (AWE).

(e) Electricity: Others will provide the electrical distribution system , including the primary feed from the distribution line to the pad-mounted transformer. See Appendix J for drawings. Complete the design and construct the work from the pad-mounted transformer. Provide underground secondary service from the pad-mounted transformer to the building electrical equipment room. Power for buildings will be provided from pad-mounted distribution transformers. Locate electric meters in service entrance electrical equipment/switchgear located in the main electrical room. Coordinate with the Infrastructure Contractor for installation of the primary underground feeder to the service entrance transformer.

(f) Communications. See Appendix J for Communications service plans and capacities. Coordinate through the CO with the Fort Sill Directorate of Information Management (DOIM). Determine requirements and capacity for each facility and verify with the DOIM, through the CO, that the infrastructure supports the requirements and capacity of the facility..

(g) Cable TV is privatized. The privatized utility (Sudden Link) will provide service to the building. Provide outlet locations in the building(s), including backbox, mud ring and raceway and vertical/horizontal coaxial cable wire management including, but not limited to, labeling and identification. Provide faceplates for coaxial terminator to be installed by Sudden Link. Sudden Link will terminate all Contractor provided coaxial CATV cables. Provide a pre-wired CATV system throughout designated spaces. CATV system includes, but is not limited to, cables, conduits, pull boxes and CATV jacks. Route all CATV signal conduits and cables back to the communications room or other designated room/closet.

(h) Others will provide telephone system distribution design. Local Telephone Service tie-in points are shown on the drawings at Appendix J. The Infrastructure Contractor will provide telephone conduit duct bank from the primary distribution manhole to 5 feet outside the building. Design and install the telephone conduit duct bank from the[5 foot line of the building to the communications room. Share the telephone duct bank with the communication duct bank. DOIM will provide telephone cabling.

6.4.6.1.1. Metering Utilities.

(a) Provide water meters Prepare meters for EMCS connection The gas utility provider will provide and install gas meters.. Provide connection from the gas and water meters to the EMCS system.

(b) Provide an electronic meter with equivalent capabilities to a Square D Power Logic Monitor Series 4000. Electric meter shall communicate with the EMCS. Connect to the EMCS.. Locate electric meters in the service entrance electrical equipment/switchgear located in the main electrical room.

6.4.7. Cut and Fill

6.4.7.1. The Government will provide grading as described hereinbefore.

6.4.8. Borrow Material

See Appendix HH.

6.4.9. Haul Routes and Staging Areas

6.4.9.1. Use the Haul Route(s) shown in Appendix J.

6.4.9.2. The Contractor will be allotted an area as shown in the attached Access and Haul Route Plan for the placement of a construction trailer complex, if required, and storage The D/B Contractor and their respective subcontractors will be alloted an area for the placement of a construction trailer complex and storage. D/B Contractor shall be responsible for the site preparation, fencing access drives and maintenance of his compound at all times.

6.4.9.3. For proposal purposes, the D/B Contractor may assume utilities will be provided during construction at the project site.

6.4.10. Clearing and Grubbing:

Clearing and grubbing will be accomplished by the Infrastructure Contractor.

6.4.11. Landscaping:

Coordinate landscaping scheme with the Acceptable Plant List (Appendix I). Slopes shall not exceed 10:1 unless otherwise noted or shown on the rough grading plan as shown in Appendix J. Use a drip system for all irrigation for plantings. Rip-rap isn't permitted for erosion control. Use stone or brick for edging for planting beds. Steel or plastic edging isn't permitted. Plant trees such that the grade around the tree is recessed 2-inches. Place mulch up to grade. Do not berm around trees. Make minimal use of Pine trees and evergreens. Coordinate landscaping scheme with the Contracting Officer and the ADP.

6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein . The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin appearance based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color pallets, as described herein.

6.5.2. **Design**

6.5.2.1. Appendix F is provided "For Information Only", to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on Fort Sill's Installation Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.

6.5.2.2. The design should address Fort Sill's identified preferences. Implement these preferences considering the following:

(c) Achievable within the Construction Contract Cost Limitation (CCL)

(d) Meets Milestones within Maximum Performance Duration.

(e) Achieves Full Scope indentified in this Solicitation

(f) Best Life-Cycle Cost Design

(g) Meets the Specified Sustainable Design and LEED requirements

(h) Complies with Energy Conservation Requirements Specified in this RFP.

6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation's intent for this area is:

Shown in Appendices F and BB.

6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.

6.5.2.5. See Appendix F for exterior colors that apply to Architectural character at Fort Sill. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.

6.5.2.6. Additional architectural requirements:

(a) Install fall protection anchor points on all roofs with a slope greater than 2:12

(b) **Installation Preference No. 1.** Provide standing seam metal roofing with either a 20-year comprehensive weather-tight warranty or an included maintenance contract for the period of 20 years and snow/ice guards. Provide snow/ice guards that are a standard product of the roofing manufacturer and install as recommended by the roofing manufacturer.

(c) Low slope roof systems are only allowed where required in other sections of the RFP documents. Minimum roof slope for low slope roof systems is ¼ inch per foot (2%) and 3 inches per foot (3:12) for all other roof systems. Avoid complex valleys, flashing and venting conditions, where possible.

(d) **Installation Preference No. 2**. Provide brick and/or split face CMU to be incorporated in the exterior walls. Any EIFS provided shall be high impact resistance rated to a distance of 7-feet vertically from finish grade in accordance with applicable criteria. EIFS shall incorporate a means to drain moisture to the exterior.

(e) **Installation Preference No. 3**. Eliminate the use of roof-top units (RTUs), clerestories, and minimize all other roof penetrations.

(f) Provide for attenuation of external noise sources such as airfields in accordance with applicable criteria for exterior walls and roof/ceiling assemblies, doors, windows and interior partitions.

(g) Unless, otherwise specified in paragraph 3, do not exceed levels recommended by ASHRAE Handbook Criteria for sound conditions (and levels) for interior spaces due to the operation of mechanical and electrical systems and devices.

(h) Trim and Flashing. All exterior metals including gutters, downspouts and fascias shall be factory pre-finished metal.

(i) Bird Habitat Mitigation: Provide a means to eliminate the congregating and/or nesting of birds at, on and in the facility. Direct special attention to pedestrian entrances and control of such nuisance.

(j) Exterior Doors and Frames:

(1) Main Entrance Doors: Aluminum storefront doors and frames with Architectural Class 1 anodized finish, fully glazed, with medium or wide stile are encouraged for entry into lobbies or corridors. Storefront systems shall comply with wind load requirements of applicable codes and UFC 4-010-01 requirements. Framing systems shall have thermal-break design. Color shall conform to Appendix F.

(2) Side Entrance Doors: Exterior doors and frames opening to corridors or lobbies shall be insulated hollow metal and comply with ANSI A250.8/SDI 100. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements. Color shall conform to Appendix F.

(3) Exterior Non-entrance Doors: Exterior doors and frames opening to spaces other than corridors or lobbies shall be insulated hollow metal and comply with ANSI A250.8/SDI 100. Door and frame installation shall comply with applicable codes and UFC 4-010-01 requirements. Color shall conform to Appendix F.

(k) Finish Hardware

(1) All hardware in the facility shall be consistent and shall conform to ANSI/BMHA standards for Grade 1. Coordinate all requirements for hardware keying with the CO. Hardware finishes shall conform to ANSI/BHMA A156.18. Provide ANSI 626 (Satin Chromium plated on Brass or Bronze) or 630 (Stainless Steel). Install deadbolt locks on mechanical and electrical rooms keyed to the DPW keying system. Coordinate door hardware and security requirements with the functional requirements, the Room-by-Room Criteria and the electrical security/fire alarm system requirements of this document. Provide bored locks per BHMA A156.2. Provide all hardware necessary to meet the requirements of NFPA 80 for fire doors and NFPA 101 for exit doors. Provide door closers for all exterior doors, all doors opening to corridors and as required by codes. The Main entrance door is

considered a high traffic door. Provide a high quality door closing mechanism complying with BHMA A 156.4 with adequate strength to ensure safe and easy operation in a high-wind environment.

(2) Programmable Electronic Key Card Access Systems: Even though programmable electronic key card access may be required elsewhere in the contract – do not provide such systems..

(3) Keying for Facilities: Key all doors individually, even if the doors lead to the same room. The mechanical, electrical, and communication rooms may be keyed alike, but the Installation encourages that they be keyed to the DCF-1. The cores for the mechanical electrical and communications rooms, if not keyed to the DCF-1, shall have a cylinder that is capable of receiving a Best Lock core. Provide four (4) keys for each lock. Provide master keys.

(l) Exterior Signage: The Government will provide building identification s signs and illumination, where required, outside of 5-feet from the building. Design and install exterior signage attached to the facility and within 5-feet of the facility per Appendix H, Exterior Signage. Coordinate requirements with the Government.

(m) Exterior Windows: Provide operable windows with locks and insect screens removable from the inside.

(n) Thermal Insulation: Do not install Insulation directly on top of suspended panel ceilings.

(o) Exterior Louvers: Provide exterior louvers designed to exclude wind-driven rain, with bird screens, and made to withstand wind loads in accordance with the applicable codes. Provide wall louvers with the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511.

(p) Exterior Paint Systems: Provide Exterior Paint Systems in accordance with the recommendations of the Master Painters Institute (MPI) for the substrate to be painted and the environmental conditions existing at the project site. Provide a minimum one prime coat and two finish coats for exterior surfaces (surfaces except factory pre-finished material). For exterior applications, provide an MPI Gloss Level 5 finish (semi-gloss) unless otherwise specified. Apply all paints in accordance with the manufacturer's instructions.

6.5.3. Programmable Electronic Key Card Access Systems:

Not Required.

6.5.4. INTERIOR DESIGN

6.5.4.1. Interior building signage requirements:

See Appendix AA for Ft. Sill signage requirements.

Fully integrate interior signage as a design element with the architecture and interior design. Provide modular signage for general office areas to accommodate personnel changes or room function changes. Use International symbols to the maximum extent possible. Locate emergency/fire evacuation plans at key areas to ensure fire safety. Coordinate signage plaque colors with the interior color scheme. Provide rooms signs for electrical or mechanical spaces. Provide room control sign for conference room(s).

6.5.4.2. Interior Design Considerations:

Provide maximim use of day lighting and operable windows within the constraints of the contract requirements. Provide interior surfaces that are easy to clean and light in color. Plan the interior spaces to allow maximum flexibility for future modifications.

(a) Interior Partitions and Walls. Non-combustible construction is encouraged even where combustible materials are allowed by code.

(b) Provide each occupied facility with an appropriately sized room that has been "hardened" to resist the forces of tornadoes which are prevalent in Oklahoma. Provide room in accordance with ICC-500 and FEMA 361.
(c) Interior Glass and Glazing: Coordinate the arrangement of fenestrations with the proposed furniture layout.

(c) Where moisture or moisture infiltration from the wall cavity cannot be eliminated or sufficiently reduced, consider the use of wall coverings with higher permeability ratings. Don't use f wall coverings that do not breathe, such as vinyl wall coverings in high humidity areas due to the tendency for mold to develop.

(d) Floors and Ceilings: Non-combustible construction is encouraged even where combustible materials are allowed by code.

(e) Interior Doors and Frames: Provide hollow metal doors and frames or wood doors in accordance with the standard design and requirements of the project. All door frames shall be hollow metal.

(f) Paint: Comply with the recommendations of, the Master Painters Institute (MPI) for the substrate to be painted and the interior environmental conditions existing at the project site. Paint a minimum of one (1) prime coat and two (2) finish coats for interior surfaces, except factory pre-finished material or interior surfaces receiving other finishes. In wet areas, provide an MPI Gloss Level 5 (semi-gloss) finish. Apply all paints in accordance with manufacturer's instructions.

(g) Gypsum Board: Comply with ASTM C 36. Minimum panel thickness shall be 5/8-inch. Provide moisture resistant panels (glass-mat panels are encouraged) at locations subject to moisture.

6.5.4.3. Specialties and Furnishings

(a) Window Treatments: Provide horizontal mini-blinds or vertical blinds at all exterior glazed areas, unless otherwise noted.

(b) Bulletin Boards: Provide bulletin boards consisting of a tack board, aluminum tabular frame, and sliding aluminum framed glazed doors with a permanent header panel and a general title, such as "Notices" or "Information", and a 1/4-inch cork pinning surface glued to 1/4-inch thick plywood or hardboard backing. Provide cork with a plastic impregnated surface and burlap backing. The cork's surface finish to be smooth and be free from air pockets, raised cork blemishes, and joint imperfections. Provide the door frame with a removable glazing bead applied on the inside. Glazing to be 1/4-inch polished laminated glass. Each bulletin board door shall be complete with hardware including key operated lock. Provide aluminum hardware with anodized finish matching the frame. Header panel to be white letters on standard black background; cork panel - medium gray. Bulletin board dimensions to be 4 feet by 6 feet. Heading message shall be upper and lower case Helvetica medium, 2-inch capital letter height, centered. Secure frame to the wall by means of concealed screws or bolt hangers.

(c) Projection Screens: Provide projection screens that are ceiling recessed mounted and manual. Screens shall be flame retardant, mildew resistant and white matte with black masking borders. Bottom of screen fabric to be weighted with metal rod. Roller to be a rigid metal at least 3 inches in diameter mounted on sound absorbing supports. Ceiling recessed case to be extruded aluminum. Screens shall be UL listed. Projection screen viewing area shall be minimum 7'-3" high x 9'-8" wide. Provide one ceiling recessed mounted projection screen in each conference area.

(d) Projector Mount: Furnish and install a low profile ceiling mounted projector mount system. PROJECTOR NOT INCLUDED IN CONTRACT. Ceiling mount shall consist of a steel ball joint and Universal Projector Bracket. Mount shall project a maximum 6 inches below finished ceiling height and shall securely attach to ceiling and structure above with steel mounting plate. Provide mounting hardware appropriate to ceiling conditions. Steel ball joint attaches to the Universal Projector Bracket with twist-lock engagement. Mount shall provide up to 30° roll or pitch adjustment and 360° yaw adjustment at ball joint. Two setscrews lock ball joint in position. Silver finish. Maximum load to be 26 lbs. Furnish and install concealed electrical wiring, connections and accessories necessary for projector operation. Provide one low profile ceiling mounted projector mount system in each conference area.

(e) Corner Guards. Provide surface-mounted, high-impact integral color rigid vinyl corner guards at all outside corners of gypsum board walls.

(f) Chair Rail. Install chair rails in areas prone to hi-impact use, such as corridors, classrooms, conference rooms, etc.

(g) Toilet Accessories: All toilet accessories shall be Type 304 stainless steel with satin finish.

6.6. STRUCTURAL DESIGN

6.6.1. Site Specific Loading Requirements:

6.6.1.1. Use basic wind speed of 90 mph 3-second-gust, in miles per hour, for wind loads.

6.6.1.2. Use ground snow load of 10 psf.

6.6.1.3. Use frost penetration of 14 inches.

6.6.1.4. Use the following seismic acceleration parameters for mapped Maximum Considered Earthquake spectral response at short periods and at 1-second period, respectively: Ss: 38 (%g) and S1: 2 (%g).

6.6.2. Equipment Pads: Elevate floor or on-grade mounted equipment on minimum 4 inch thick concrete pads to prevent accumulation of water and metal corrosion.

6.6.3. Foundation

6.6.3.1. Due to soil conditions at Ft. Sill, the use of pier and supported grade beam foundation with structurally supported slab, conventional rib mat slabs or thickened structural slabs is required for this project. Slabs on grade or floating slabs are not permitted.

6.6.3.2. Perform controlled expansion consolidation tests on undisturbed samples collected from the overburden material to assess potential settlement and/or heave for piers and edge lift/center lift conditions for ribbed mat slabs and thickened slabs in accordance with ASTM D 4546, Method C, latest edition. Heave predictions using the Potential Vertical Rise (PVR) method or swell pressure predicted from free swell test are not allowed.

6.6.3.3. Assume a minimum 15-foot active zone measured from top of existing ground for uplift and heave calculations.

6.6.3.4. Provide foundation systems for permanent facilities capable of supporting the typical loadings specified elsewhere in this document that are capable of resisting the soil movement and chemical characteristics of the soils present for the design life of the facility. Systems proposed are to have been used successfully at the Installation for a time period equal to the design life of the proposed facility or submit documentation from an acceptable independent certifying entity certifying that a proposed alternate system has been used successfully for a period of time equal to the design life of the proposed facility on a minimum of 10 facilities where the soil movement and chemical characteristics are the same as at the Installation.

6.6.3.5. Site Features – Retaining Walls/Bridges/etc. Design site features with maximum 2 in 1 slope (same as the earth cover). Design site features to drain properly and tie into the drainage collector system.

6.7. THERMAL PERFORMANCE

There are no additional requirements other than those previously stated/referenced.

6.8. PLUMBING

6.8.1. **Piping Materials:** Provide Piping materials per applicable criteria but pipe materials may be restricted based on specific conditions at a particular site. Type M copper is not allowed. Type L above ground pressure piping and copper Type K for underground pressure pipe are preferred. Non-plastic drainage, waste and venting (DWV) plumbing materials are preferred, however, PVC or ABS waste and vent pipe is acceptable.

6.8.2. **Cross Connection Control**: Follow local site specific requirements for cross connection control / backflow prevention. Provide an inlet water backflow prevention device for each facility. Protect potable water systems from contamination by hydronic water and other industrial and mechanical systems via a reduced pressure zone backflow preventer.

6.8.3. **Natural Gas Supply**: Normally use the standard gas pressure from utility provider's building regulator of 5.3 ounces. If higher pressures are needed, coordinate those requirements with the utility provider. Provide the utility provider with required flow rate and expected gas usage diversity so the utility provider may provide the appropriate metering and regulation equipment. Report no diversity, that is, all loads are firing at the same time in the facility.

6.8.4. **Gas Regulator Venting**: Vent all gas regulators in building to the outside.

6.8.5. **Domestic Water Heating**: The Installation encourage the use of point-of-use instantaneous domestic hot water heaters for small hot water demand areas such as small restrooms (small is considered to be two lavatories or less) and gas-fired hot water storage heaters for larger demand areas such as larger gang restrooms and restrooms with showers.

6.8.6. **Exterior Water Piping Freeze Protection**: Design seasonally utilized (not used in winter) water supply piping for complete drain down.Provide an interior or below grade isolation valve. Insulate exposed water piping that is utilized year round, heat traced and protected with pipe jacketing to ensure that the piping will not freeze.

6.8.7. **Fixture Faucet Mixing Valves**:

(a) For administrative and classroom facilities, the automatic flush and water valves, with long-life batteries and backup manual flush buttons, for water closets, urinals and lavatories perform best.

(b) Provide automatic mixing type with anti-scald temperature control shower valves (pressure balancing/compensating type). Additionally, valves shall not have any internal or exterior plastic parts.

6.8.8. **Wall Hydrants**. Provide non-freeze wall hydrants on all building faces at no more than 100-feet intervals.

6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.9.1. **Exterior Lighting**. Design and install exterior lighting within the construction limits. Exterior site and area lighting shall be pulse-start metal-halide (PSMH) or induction type, except compact fluorescent lighting is acceptable for walkway lighting where suitable for the climatic conditions. Exterior lighting includes parking areas, hardstands, roadways and walkways. Photo control devices for exterior lighting shall have adjustable operation range of approximately 0.5 to 5.0 foot candles. Provide protective lighting systems at the perimeter fence where required by the specific project to deter trespassers and to make them visible to guards. Use 90 degree cut off lighting facing any runway.

6.9.2. **Exterior Electrical**: Design and extend the electrical service underground from the pad-mounted transformer to building service equipment/main electrical switchgear.. Coordinate all electric work and interruptions through the CO and Ft Sill DPW. The existing distribution system is a 13,200Y/7,620 V three-phase, four-wire multi-ground system. Duct lines (600-volt) shall be direct buried thick wall type; concrete encased in vehicular traffic areas. Provide two spare conduits from the transformer to the building service equipment/main electrical switchgear..

6.9.3. **Exterior Communications**: Communications service to the buildings shall be underground six-way 4-inch conduit duct banks. Design and install the duct bank from 5-foot outside the building to the building's communications room. In each duct bank; dedicate one (1) 4-inch conduit to copper cables; dedicate one (1) 4-inch conduit to CATV coaxial cable and dedicate one (1) 4-inch conduit with two (2) 3-way fiber mesh to fiber optic cable. The other three (3) 4-inch conduits are spare. Others will provide duct bank, fiber optic and copper cabling from the manhole(s) to within 5-foot of the building at a location closest to the communications room under separate contract. Others will splice and complete the termination of the outside plant cables in the manhole and communications room. Securely fasten all entrance conduits to the building so they can withstand a typical placing operation. Keep area around the entrance conduit free of any construction, storage and mechanical apparatus.

6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

6.10.1. Power system study shall consist of fault analysis and coordination study.

6.10.2. **Lightning Protection and Grounding**: Provide lightning protection shall be provided based on NFPA 780 (2004) Annex L Lightning Risk Assessment of the facility. Provide grounding, bonding, shielding for all facilities. Provide grounding straps and connect to the building grounding system. Provide grounding points in vehicle and equipment parking areas on 20 foot centers (maximum) and coordinated with the power and data board units. Provide ground strap on walls, and two (2) grounding points on each functional bay floor. Provide a bonding grounding in oil storage room.

6.10.3. **Closed Circuit TV (CCTV):** Install a conduit system to support CCTV throughout designated spaces.The conduit system includes but is not limited to conduits, pull boxes and pull wires. Route all conduits for CCTV signals back to the telecommunications room or the designated monitoring room.

6.10.4. **Telephone and Local Area Network (LAN):** Provide complete riser diagrams and equipment locations on the drawings. Connect the facility to the installation Campus Area Network (CAN) System and telephone system in accordance with the I3A (and SIPRNET guide, where applicable in paragraph 3). Coomumications systems resources will be allocated in accordance with the I3A regarding outlet densities based upon the functionality of the facility's (ies') various component floor spaces. Connect all standard MILCON outlets from the telecommunications room equipment communication patch panels with 2 pair, TIA/EIA 568-B Category 6 unshielded twisted pair (UTP) solid copper station cable. Connect all single 8-position wall outlets from the commercial rack patch panels with one pair TIA/RIA 568-B CAT 6 UTP cable. Provide a weatherproof telephone enclosure located on an exterior wall near the main entrance of each building.

6.10.5. Communication Testing. Provide material and documentation for communication testing. Provide complete end-to-end certification of all wire/cable installed in accordance with the TIA/EIA 568 Standards. Provide 30 days notification of testing. Testing includes but is not limited to:

(a) A submitted and Government approved test plan.

(b) Test of all installation ground bus bars, wiring and ground grids.

(c) Furnishing test results within 7 days of testing performance and prior to final acceptance.

(d) Test results include, as a minimum, electrical resistance readings, continuity readings, insulation and resistance and dB loss readings. Include graphical representation of results. Include: date, time, tester, building number, room number and panel number.

6.10.6. Terminate all components prior to testing. There will be no acceptance of equipment and systems until the required inspections and tests have been made and submittal of the required documentation to the Government.

6.11. HEATING, VENTILATING, AND AIR CONDITIONING

6.11.1. General:

6.11.1.1. Integration of new facilities into the existing EMCS database and monitoring and controls software (such as the Post-wide demand limiting) will require generation of custom graphics matching the style and complexity of the existing graphics. Integration of new facilities shall also include programming of alarm handling and demand load limiting which will require Directorate of Public Works (DPW) input for critical alarm lists and priority of building for demand load limiting. This must be done at the existing EMCS "front-end." Integration will be limited to qualified companies and personnel. Fort Sill's encourages the use of Tour Andover Controls (TAC) or their designated local representative in Oklahoma City, OK (OKC) do the integration; TAC's OKC representative is, Energy Management & Controls Synergy (EMCS), contact Mr. Jeff Houpt, 405-528-3627. Other possible integrators are: Tang & Associates, contact Mr. John Huston, 312-616-7498 or EMC Engineers, contact Mr. Carl Lundstrom, 678-254-1221. Note that TAC and EMC Engineers are the only companies currently familiar with the Fort Sill EMCS.

6.11.2. **Water Quality Analysis and Treatment**: Water quality for the Installation and surrounding area is "hard." Treatment will be required for use as make-up water in HVAC equipment. Water Quality Analysis reports are included at Appendix. . Additional water analysis data from water treatment contractor is provided below:

Chlorides: 16 ppm

Total Alkalinity: 90 – 140 ppm (Total alkalinity varies by season.)

Total Hardness: 157 ppm ($CaCO_3$)

ph: 8.00

Silica: 3.4 ppm (SiO_2)

Iron: approx. 0.017 Reactive (Leaving plant; varies with location, age of piping, etc.)

Total Dissolved Solids: 190 ppm

6.11.2.1. Coordinate with water treatment contractor to confirm water data and current water treatment methods to obtain the required quantity and types of chemicals to be initially introduced into the closed loop heating and chilled water systems. Currently, water treatment is contracted by VT Griffin to Nalco Chemical Company.

6.11.3. Fuel for Heating/Cooling

6.11.3.1. **Installation Preference No. 4**. Ft. Sill's preference for heating/cooling systems is geothermal or natural gas heating with geothermal most preferred. The preferred type of geothermal system is drilled wells with closed circuit earth heat exchange pumping and piping system to gather heat from the earth for exchange to water or air for heating in the facilities.

6.11.3.2. HVAC Cooling Building Systems: Electric driven refrigeration and cooling systems are the most prevalent types at Fort Sill. Geothermal systems and other renewable or highly energy-efficient types of cooling are definitely encouraged over standard refrigeration-based equipment (DX, chilled water, etc.), where they are applicable. Fort Sill currently has several facilities (family housing, UEPH, BEQ, large office buildings, etc.) that are cooled and heated by geothermal closed-loop, drilled vertical borehole systems that are very successful. Evaporative cooling, direct and indirect evaporative building cooling systems, can be energy efficient; and state-of-the-art types proposed will be readily considered as long as site limitations such as climate, dust storms, etc. are taken into account. Do not provide the old style "swamp" direct evaporative pad or media coolers as a form of building cooling as they suffer from water mineral, dirt buildup and are maintenance intensive.

6.11.3.3. HVAC Central Cooling Plant Systems (serving more than one building or facility): Electric driven refrigeration and cooling systems are the most prevalent types at Fort Sill. Chiller plants mainly employ electric centrifugal chillers with water cooling towers. While this type of system is acceptable for maintenance and durability, Ft Sill encourages the use of other types of cooling systems, such as geothermal central plants that have been installed and are in use. Newer plants, where they are proposed or required should be of much higher efficiency than standard energy code minimum systems and are highly encouraged to employ renewable energy such as geothermal. The recommended type of geothermal cooling/heating system is drilled wells with closed circuit earth, lake, etc. heat exchange to water for cooling/heating plants.

6.11.4. Mandatory Equipment Requirements:

6.11.4.1. All mechanical equipment shall automatically restart after a power outage. Provide equipment such as boiler low water boiler cut-offs and controls that can restart in a normal mode after power is restored. Protect all mechanical equipment and controls against power surges and low and high supply voltage situations. Power loss, surges or low or high voltage shall not, in any way, effect HVAC or plumbing equipment or controls, set points, controls bindings etc.

6.11.4.2. Boiler Size: The maximum allowable individual boiler size that can be utilized is 10 million Btu per hour (input); this is a non-negotiable and mandatory Ft Sill requirement for them to operate under their current Environmental Air Quality Permit.

6.11.4.3. HVAC On/Off Switch. Provide an on/off switch for all HVAC systems in a central location as per UFC 4-010-01. Coordinate this requirement and switch features with local installation DPW during design.

6.11.4.4. HVAC Controls: Provide manual button or switch allowing users to have the capability to do minimal "run longer" control. Intent is for building users to work odd shifts without requiring Installation DPW input. HVAC controls shall provide all of the monitoring and controls points as mentioned for EMCS and shall expose all of the reset, tuning, etc. parameters as required for a completely open system as discussed above for EMCS. Coordinate with the CO to obtain the building occupied/unoccupied schedule for the facility; use that schedule for building controls and EMCS.

6.11.4.5. Chilled Water System Volume Requirements. For each chilled water system, the system must contain a minimum of 4-gallons per ton of chilling capacity, or more, if required by the manufacturer of proposed chiller. The volume calculation shall exclude the water volume of the chiller and all load heat exchange developed (coils, etc.) in the system. If the system volume does not contain the minimum volume, a chilled-water storage tank shall be designed to bring the system volume to the required minimum. The chilled-water storage tank shall be piped into the chilled water return line upstream of the chiller.

6.11.4.6. Provide all exterior air cooled HVAC equipment with hail guards.

6.11.4.7. Generator Equipment: Stationary emergency or electrical generator equipment shall use natural gas as a fuel source. This is required by the Installation's Environmental Permit.

6.11.5. **Installation Preference No. 3.** Ft. Sill prefers that no equipment, including HVAC, be roof mounted. However, if provided by the D/B Contractor, the D/B Contractor shall provide proper permanent ladders, roof-protecting walking surface and adequately large OSHA-approved work surfaces around each device or piece of equipment. See paragraph 6.5.2..

6.11.5.1. Equipment Placement: When possible, place the of air handling equipment to be either within the building spaces (i.e., equipment rooms or plants, etc.) which are sound isolated, within exterior on-grade equipment yards which are enclosed with screen walls or within enclosed roof penthouses. The Installation DPW encourages designers to organize vents, stacks, grilles and placement of mechanical or electrical service fixtures into locations which do not provide visually negative design impacts. Where possible, avoid catwalks especially when up and down travel is required to service multiple equipment pieces. (Coordinate with architectural design and RFP requirement.)

6.11.6. **Fort Sill's Freeze Protection**: Provide full protection down to lowest temperature with propylene glycol (PG) solution (dowfrost HD) or a combination of a lower concentration of PG in combination with controls logic to start and run the chilled water pumps to circulate water to help avoid freezing. If any secondary protection is required or provided it shall be self regulating, industrial grade with shielded jacket heat tracing.

6.12. ENERGY CONSERVATION

6.12.1. General

Energy conservation is a prime objective and measures shall include but not limited to following:

ASHRAE 90.1 - Energy performance shall be governed by ASHRAE Standard 90.1, exceeded by ***AM1 40%** ~~30%~~ * for each facility. The Offerors shall document in the design analysis (design after award) that the building and systems exceed the standard by the required minimum percentage utilizing hand annotated Standard 90.1 reporting forms and hour-by-hour energy analysis software (TRACE, E20-II HAP, BLAST, etc.) , required life-cycle cost equipment selection and building energy analysis.

(a) Electronic Ballasts

(b) Switched Light Fixtures

(c) Occupancy and photo sensors

(a) Solar Power for Exterior Lighting

(b) Variable Frequency Drives

(c) Timers

(d) High efficiency motors.

(e) Daylighting

(f) Heat recovery from exhaust

(g) Shower gray water heat recovery

6.12.2 Usage of high efficiency (equal to or greater than 90%) boilers and water heating equipment is strongly encouraged in order to save energy. Additionally, use of boilers or heating equipment that features fully ducted combustion air intake is encouraged**.**

6.12.2. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

See paragraphs 3 and 5. ***AM1 The following statement supercedes the statement contained in paragraph 3.6.1: "The building, including the building envelope, HVAC systems, service water heating, power, and**

lighting systems. shall be designed to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90 (see paragraph 5.9 Energy Conservation." *

6.13. FIRE PROTECTION

6.13.1. Fire Sprinkler Service: Provide a separate fire sprinkler service connection within each building that requires fire sprinklers. The Infrastructure Contractor will provide the Post Indicator Valve (PIV) and any bollards required for protection and route the fire water line (separate from the domestic supply) to 5 feet from the building. Provide for all piping from the 5-foot line of the building and within the building. Provide Knox boxes.

6.13.2. Provide fire hydrants.

6.13.3. Riser Location: Install fire risers in a dedicated space or mechanical room with external access and keying for the Fire Department.

6.13.4. Fire Sprinkler Seismic Design: Since the installation is located in a seismic zone, design fire sprinkler systems for protection of piping against damage from earthquakes per NFPA 13.

6.13.5. Fire Sprinkler Backflow Prevention: Double check valve backflow preventers are the minimum protection required for all sprinkler systems. Systems utilizing antifreeze require reduced pressure principle backflow preventers.

6.13.6. Mass Notification System (MNS)/Public Address (PA): The MNS system shall be fully functioning and shall be designed and installed to operate as both MNS and PA. The systems shall be zoned and permit zonal selection of paging by both installed microphone jacks and telephone dialup. Indicating devices shall be visual and located throughout the facility including exterior wall locations. All strobes for the MNS shall be synchronized with the fire alarm strobes in the event both are active at the same time. The MNS shall have the ability to interrupt all localized audio systems that are independent of the building-wide PA system. The Installation-wide giant voice system is an ADT MNS. Each building shall communicate with the ADT Central Control Unit via an existing radio frequency transmitter and antenna. Furnish and connect the following equipment:

(a) One (1) mass notification panel in accordance with the requirements of UFC 4-021-01 and compatible with the existing giant voice system at Fort Sill.

(b) One (1) transceiver with the ability to communicate with the Installation's big voice radio frequency (RF) equipment with the ability to transmit and receive information.

(c) Install One (1) antenna at the facility.

(d) Connect eight (8) dry contacts to the building MNS for controlling prerecorded messages and push-to-talk for audio (remainder of the eight (8) shall become spares). Connect the 600-ohm audio for audio from the central control unit to the MNS.

6.13.7. Fire Alarm Systems: Provide Class A addressable systems consisting of a fire alarm panel, an RF transceiver, initiating devices and notification devices. The Fire Alarm Control Panel shall be fully compatible with the existing Monaco system. Provide pull stations that are single-action, non-glass rod type.

6.13.7.1. **Installation Preference No. 5**: Provide the required fire alarm system with 72 hours of standby with 15 minutes of alarm in lieu of the 24 hours of standby required by code.

6.13.7.2. The RF transceiver shall be a Monaco BT-X (verify with Post Fire Chief) or approved equal operating on a frequency of 141.3625 MHZ. Provide transceiver communication with the Lawton, Oklahoma 911 dispatch located off Post

6.13.7.3. The fire alarm receiving system is a Monaco D-21 system.

6.13.7.4. Provide zone by zone information sent to the Fire Department receiving system. Send All tamper devices to the D-21 system as a supervisory tamper.

6.13.7.5. Provide all initiating devices that are connected, Class A, Style D, to signal line circuits (SLC), Style 6.

6.13.7.6. Provide all alarm appliances connected to notification appliance circuits (NAC), Class A, Style Z.

6.13.8. Furnish all software, software locks, special tools and any other proprietary equipment required to maintain, add devises to or delete devices from the system or test the fire alarm system prior to the final inspection of the system.

6.14. SUSTAINABLE DESIGN

6.14.1. LEED Rating Tool Version. This project shall be executed using LEED-NC Version 3.

6.14.2. The minimum requirement for this project is to achieve LEED Silver level. Each non-exempt facility (building plus sitework) must achieve this level. In addition to any facilities indicated as exempt in paragraph 3, the following facilities are exempt from the minimum LEED achievement requirement: None..

6.14.3. Credit Validation: The project is a standard design building(s) portion of a multiple contractor Combined Project. LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is required. Registration and payment of registration fees will be by the Government. Administration/team management of the online project will be by the Contractor. See Appendix LEED Requirements for Multiple Contractor Combined Projects for information about registered standard designs. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is not required. The Government may choose to seek LEED certification of the project, in which case the Government will pay certification fees and coordinate with GBCI and the Contractor will furnish audit data as requested at no additional cost.

6.14.4. Commissioning: See Appendix M for Owner’s Project Requirements document(s).

6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

MR Credit 2 Construction Waste Management.

The Installation does not have an on-post recycling facility available for Contractor's use.

Regional Priority Credits (Version 3 only)

The project zip code is 73503.

See LEED Multiple Contractor Responsibilities Table(s) for additional information.

6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.

6.14.7. Multiple Contractor Combined Project. When site work and building(s) are accomplished by separate contractors, it is a Multiple Contractor Combined Project for purposes of LEED scoring and documentation. This project is part of a Multiple Contractor Combined Project that includes site work and building(s) accomplished by separate contractors. See Appendix LEED Requirements for Multiple Contractor Combined Projects and Appendix LEED Multiple Contractor Responsibilities Table(s) for special requirements for this project.

6.14.8. Additional Information

No additional requirements.

6.15. ENVIRONMENTAL

6.15.1. Solid Waste Disposal/Diversion Practices:

6.15.1.1. Solid Waste Disposal/Diversion Practices shall be in accordance with Ft Sill Landfill policies and LEED requirements. No offsite disposal is permitted. Dispose of all construction material waste and debris from demolition in the Ft Sill landfill (Dodge Hill). Items that can be used to help decrease diversion rates include salvaged items (may be reused by others), scrap metal, masonry products, gravel, asphalt, concrete, rock and topsoil (earth fill is specifically excluded). There are segregated areas at the landfill for disposal of asphalt, concrete and rock. Dispose of waste fill on Post; The Contracting Officer (CO) will coordinate and approve location of disposal areas. There is no charge for using the Ft Sill Landfill. Confine construction limits to the construction site boundaries shown on the drawings within Appendix J.

6.15.1.2. Government policy applies to sound environmental principles in the design, construction and use of facilities. As part of the implementation of that policy, (1) Practice efficient waste management when sizing, cutting, and installing products and materials, (2) use all reasonable means to divert construction, and demolition waste from landfills and incinerators and to facilitate their recycling or reuse.

6.15.2. Asbestos containing materials (ACMs), lead based paint (LBP), or PCBs shall not be used in the project.

6.15.3. Air pollution restrictions applicable to this project do not allow materials to be burned on Government premises.

6.15.4. Oil Water Separators (OWS). Fort Sill requires OWS to be installed in a vault per local EQD requirements. Equip the oil water separator with a sensor/alarm panel that indicates when the separator requires service. Also include a sump pump tied to the separator for removal of rainwater from the vault.

6.16. PERMITS

Obtain permits from Fort Sill for each generator required for on-site electrical service. Note that generators equal to or larger than 500 hp, in use for more than 1-year require a permit from Fort Sill EDQ.

6.17. DEMOLITION

None.

6.18. ADDITIONAL FACILITIES

None.

End of Section 01 10 00.*AM1 RFP02*

SECTION 01 32 01.00 10
PROJECT SCHEDULE

1.0 GENERAL

1.1. REFERENCES

1.2. QUALIFICATION

2.0 PRODUCTS (NOT APPLICABLE)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.2. BASIS FOR PAYMENT AND COST LOADING

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

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3.5. SUBMISSION REQUIREMENTS

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3.8. DIRECTED CHANGES

3.9. WEEKLY PROGRESS MEETINGS

3.10. OWNERSHIP OF FLOAT

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. ARMY CORPS OF ENGINEERS (USACE) ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems http://www.usace.army.mil/publications/eng-regs/er1-1-11/entire.pdf
- Army Corps of Engineers ECB No. 2005-10, (31 August 2005) Scheduling Requirements for Testing of Mechanical Systems in Construction http://www.wbdg.org/ccb/ARMYCOE/COEECB/ecb_2005_10.pdf

1.2. QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of the schedule and all required updating (statusing) and preparation of reports. The authorized representative shall be experienced in scheduling projects similar in nature to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.1.1. Submit a project schedule as specified herein for approval showing the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences is required. Contractor management personnel shall actively participate in its development. Designers, subcontractors and suppliers working on the project shall also contribute in developing an accurate project schedule. The schedule must be a forward planning as well as a project monitoring tool. The approved project schedule shall be used to measure the progress of the work and to aid in evaluating requests for excusable time extensions. The schedule shall be cost loaded and activity coded as specified herein. The schedule will provide the basis for all progress payments. If the Contractor fails to submit any schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule

3.1.2. Status the schedule on at least a monthly basis, as specified herein. If in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained. See paragraph 3.7.4.

3.1.3. Failure of the Contractor to comply with the requirements of the Contracting Officer shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

3.2. BASIS FOR PAYMENT AND COST LOADING

The schedule shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update or qualified scheduling personnel will result in an inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure of the Contractor to provide all information, as specified herein will result in the disapproval of the preliminary, initial and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the

project schedule have been made. Activity cost loading shall be reasonable as determined by the Contracting Officer. The aggregate value of all activities coded to a contract CLIN as specified herein shall equal the value of the CLIN on the Schedule.

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the project schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule. Scheduling software that meets the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER-1-1-11(1995) referenced herein are Primavera Project Planner (P3) by Primavera, and Open Plan by Deltek.

3.3.1. Use of the Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the project schedule. Prepare the project schedule using the Precedence Diagram Method (PDM).

3.3.2. Level of Detail Required

Develop the project schedule to an appropriate level of detail. Failure to develop the project schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.3.2.1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

3.3.2.2. Design and Permit Activities

Design and permit activities, including necessary conferences and follow-up actions and design package submission activities shall be included. The Contractor shall include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. The schedule shall include review and correction periods associated with each item.

3.3.2.3. Procurement Activities

The schedule must include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve, procure, fabricate, and deliver.

3.3.2.4. Mandatory Tasks

The following tasks must be included and properly scheduled:

3.3.2.4.1. Submission, review and acceptance of design packages

3.3.2.4.2. Submission of mechanical/electrical/information systems layout drawings

3.3.2.4.3. Submission and approval of O & M manuals

3.3.2.4.4. Submission and approval of as-built drawings

3.3.2.4.5. Submission and approval of 1354 data and installed equipment lists

3.3.2.4.6. Submission and approval of testing and air balance (TAB)

3.3.2.4.7. Submission of TAB specialist design review report

3.3.2.4.8. Submission and approval of fire protection specialist

3.3.2.4.9. Submission and approval of testing and balancing of HVAC plus commissioning plans and data. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with Engineering and Construction Bulletin (ECB) No. 2005-10 dated 31 August 2005.

3.3.2.4.10. Air and water balancing

3.3.2.4.11. HVAC commissioning

3.3.2.4.12. Controls testing plan submission

3.3.2.4.13. Controls testing

3.3.2.4.14. Performance Verification testing

3.3.2.4.15. Other systems testing, if required

3.3.2.4.16. Contractor's pre-final inspection

3.3.2.4.17. Correction of punch list from Contractor's pre-final inspection

3.3.2.4.18. Government's pre-final inspection

3.3.2.4.19. Correction of punch list from Government's pre-final inspection

3.3.2.4.20. Final Inspection

3.3.2.5. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

3.3.2.6. Activity Work Area Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

3.3.2.7. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system.

Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and therefore liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities shall not be Responsibility Coded to the Government unless approved. An activity shall not have more than one Contract Changes/REA Code

3.3.2.8. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

3.3.2.9. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities, based upon the phase of work in which the activity occurs. Code activities to either a Design Phase or a Construction Phase. Code fast track design and construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

3.3.2.10. Category of Work Coding (CATW)

Assign Category of Work code to all Activities based upon the category of work which the activity belongs. Category of Work Code must include, but is not limited to: Design, Design Submittal, Construction Submittal, Approval, Acceptance, Procurement, Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start Up, Test, and Turnover. Assign a Category of Work code to each activity. Each activity shall have only one Category of Work Code.

3.3.2.11. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 04.00 10, Contractor Quality Control. An activity shall not have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

3.3.3. Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from NTP date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract duration in the accepted contract proposal, as adjusted for any approved contract time extensions. The first scheduled work period shall be the day after NTP is acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

3.3.3.1. Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" or "NTP". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, with a zero day duration.

3.3.3.2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations shall result in negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the “project must finish by” date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as “zero fee float” or “zero total float” are typically prohibited. There shall only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

3.3.3.3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, the Contractor shall identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

3.3.4. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

3.3.4.1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The “Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.3.4.2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

3.3.4.3. Phase “X” Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Disable program features which calculate one of these parameters from the other.

3.3.6. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Correct out of sequence progress that continues for more than two update cycles by logic revision, as approved by the Contracting Officer.

3.3.7. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule shall not have a negative value. Do not use Start to Finish relationships (SF).

3.3.8. Calculation Mode

Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") will not be allowed.

3.3.9. Milestones

The schedule must include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

3.4. PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s) and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3)

3.4.2. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule shall be at a reasonable level of detail as determined by the Contracting Officer. The schedule shall include detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit submissions and any required Government actions; and long lead procurement activities required prior to design completion. The Initial Project Schedule shall include the entire construction sequence and all fast track construction activities, with as much detail as is known at the time but, as a minimum, shall include all construction start and completion milestone activities, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction, including cost loading, but it may be scheduled summary in nature. As the design proceeds and design packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone.

3.4.3. Design Package Schedule Submission:

With each design package submitted to the Government, submit a frag-net schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

3.4.4. Periodic Schedule Updates

Based on the result of the meeting specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed procurement and construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

3.4.5. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: www.rmssupport.com. The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)
3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of Work
7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)
9	FOW2	10	Feature of Work (used up to 20 characters in length)
10	FOW3	10	Feature of Work (used up to 30 characters in length)

3.5. SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

3.5.1. Data CD’s

Provide two sets of data CD's containing the project schedule in the backup format. Each CD shall also contain all previous update backup files. File medium shall be CD. Label each CD, indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file names. Each schedule shall have a unique file name as determined by the Contractor.

3.5.2. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through its analysis. Identify and explain why any activities that, based their calculated late dates, should have either started or finished during the update period but did not.

3.5.3. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4. Schedule Reports

The format, filtering, organizing and sorting for each schedule report shall be as directed by the Contracting Officer. Typically reports shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

3.5.4.1. Activity Report

A list of all activities sorted according to activity number.

3.5.4.2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order sorted by activity number.

3.5.4.3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.4.4. Earnings Report by CLIN

A compilation of the Contractor's Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining progress payments. Group activities by CLIN Item number and sort by activity number. This report shall: sum all activities coded to a particular CLIN and provide a CLIN Item percent earned value; and complete and sum CLIN items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

3.5.5. Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished.

The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1. Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.5.2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3. Critical Path

Clearly show the critical path.

3.5.5.4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6. PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor's proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Match the acutal start and finish dates with the dates exported, as described in paragraph 3.3.5. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting. The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

3.6.1. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

3.6.2. Activity Statusing

Statusing information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete shall be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting:

3.6.2.1. Actual Start and Finish Dates

Accurately status the AS and/or AF dates for each activity currently in-progress or completed since the last update The Government may allow an AF date to be assigned with the percent complete less than 100% to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

3.6.2.2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

3.6.2.3. Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be statused 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1% of the total contract value, which activity(ies) may be statused 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

3.6.2.4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

3.6.2.5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

3.7. REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, the Contractor shall submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

3.7.1. Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with its request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

3.7.2. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

3.7.2.1. A list of affected activities, with their associated project schedule activity number.

3.7.2.2. A brief explanation of the causes of the change

3.7.2.3. An analysis of the overall impact of the changes proposed.

3.7.2.4. A sub-network of the affected area

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

3.7.3. Additional Submission Requirements

The Contracting Officer may request an interim update with revised activities for any requested time extension of over 2 weeks. Provide this disk within 4 days of the Contracting Officer's request.

3.7.4. If Progress Falls Behind the Approved Project Schedule

3.7.4.1. Should progress fall behind the approved schedule (more than 20 work days of negative float) due to Contractor generated problems, promptly provide a supplemental recovery or completion schedule that illustrates its efforts to regain time to assure a completion by the required contract completion date.

3.7.4.2. The supplemental recovery or completion schedule will not replace the original, approved schedule as the official contract schedule. Continue to update the original, approved schedule on at least a monthly basis. In addition, the Contractor and the Contracting Officer will monitor the supplemental recovery or completion schedule on at least a bi-weekly basis to determine its effect on regaining the rate of progress to assure project completion by the contractually required completion date.

3.7.4.3. Do not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, or shortening future work activity durations. Resource and manpower load the supplemental recovery schedule or completion schedule with crew size and productivity for each remaining activity, indicating overtime, weekend work, and/or double shifts needed to regain the schedule, in accordance with FAR 52.236.15, without additional cost to the Government. Indicate assumptions made and the basis for any logic, constraint, or duration changes used in the creation of the supplemental recovery or completion schedule in a narrative submitted for the Contracting Officer’s approval. Any additional resources or manpower must be evident at the work site. Do not modify the official contract schedule to include these assumptions.

3.7.4.4. Failure to perform work and maintain progress in accordance with the supplemental recovery or completion schedule may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the Contracting Officer in accordance with FAR 52.236-15.

3.8. DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the

Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9. WEEKLY PROGRESS MEETINGS

3.9.1. The Government and the Contractor shall meet weekly (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor’s Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI’s, RFP’s and Submittals.

3.9.2. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week “look-ahead” schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.

3.9.3. The Government and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

3.10. OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

The Contractor shall download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government and is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

End of Section 01 32 01.00 10

SECTION 01 33 00
SUBMITTAL PROCEDURES

1.0 GENERAL

1.1. DEFINITIONS

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

1.5. DISAPPROVED SUBMITTALS

1.6. WITHHOLDING OF PAYMENT

1.7. GENERAL

1.8. SUBMITTAL REGISTER

1.9. SCHEDULING

1.10. TRANSMITTAL FORM (ENG FORM 4025)

1.11. SUBMITTAL PROCEDURES

1.12. CONTROL OF SUBMITTALS

1.13. GOVERNMENT APPROVED SUBMITTALS

1.14. INFORMATION ONLY SUBMITTALS

1.15. STAMPS

1.0 GENERAL

1.1. DEFINITIONS

1.1.1. Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

1.1.2. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

SD-01 Preconstruction Submittals

- Certificates of insurance.
- Surety bonds.
- List of proposed subcontractors.
- List of proposed products.
- Construction Progress Schedule.
- Submittal register.
- Schedule of prices.
- Accident Prevention Plan.
- Work plan.
- Quality control plan.
- Environmental protection plan.

SD-02 Shop Drawings

- Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
- Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
- Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

- Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
- Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

- Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
- Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
- Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-05 Design Data

- Calculations, mix designs, analyses or other data pertaining to a part of work.
- Design submittals, design substantiation submittals and extensions of design submittals.

SD-06 Test Reports

- Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must

have been within three years of date of contract award for the project.)

- Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.
- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

SD-07 Certificates

- Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
- Confined space entry permits.
- Text of posted operating instructions.

SD-08 Manufacturer's Instructions

- Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

- Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- Factory test reports.

SD-10 Operation and Maintenance Data

- Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

SD-11 Closeout Submittals

- Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

1.1.3. Approving Authority

Office authorized to approve submittal.

1.1.4. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

1.2. NOT USED

1.3. SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1. Designer of Record Approved (DA)

1.3.1.1. Designer of Record (DOR) approval is required for all extensions of design, critical materials, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". Provide the Government the number of copies designated hereinafter of all DOR approved submittals, after the DOR has taken appropriate action. The DOR shall ensure that submittals conform to the Solicitation, the Accepted Proposal and the completed design, however see below for those submittals proposing a deviation to the contract or a substitution of a material, system, or piece of equipment that was identified by manufacturer, brand name or model description in the accepted contract proposal.

1.3.1.2. The DOR shall ensure that the submittals comply with all applicable Buy American Act and Trade Agreement Act clauses in the contract. The DOR may confer with the Contracting Officer's Representative for advice and interpretation of those clauses, as necessary.

1.3.1.3. The Government may, but is not required to, review any or all DOR approved submittals for conformance to the solicitation, accepted proposal and the completed design. Except for submittals designated as deviating from the Solicitation, the Accepted Proposal or completed design, the Contractor may proceed with acquisition and installation upon DOR approval. Government Approved (GA)

1.3.2. Government Approved (GA)

Government approval is required for any item specifically designated as requiring Government approval in the Solicitation, for internal and external color finish selections and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.3.3. Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section 01 33 16 **DESIGN AFTER AWARD** covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section 01 33 16 **DESIGN AFTER AWARD**. Generally, design submittals should be identified as SD-05 Design Data submittals.

1.3.4. Designer of Record Approved/Government Conformance Review (DA/CR)

1.3.4.1. Deviations to the Accepted Design. Designer of Record approval and the Government’s concurrence are required for any proposed deviation from the accepted design which still complies with the contract (the Solicitation and Accepted Proposal) before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings.” If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if it deems it necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2. Substitutions. Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR’s approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal.

1.3.5. Designer of Record Approved/Government Approved (DA/GA)

Any proposed deviation to the solicitation and/or the accepted proposal constitutes a change to the contract. In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is

authorized to proceed with material acquisition or installation for any proposed deviation to the contract. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Government reserves the right to accept or reject any such proposed deviation at its discretion.

1.3.6. Information Only

All submittals not requiring Designer of Record or Government approval will be for information only. Provide the Government “For Information Only” copies of all submittals not requiring Government approval or concurrence, after the Designer of Record has taken the appropriate action.

1.4. APPROVED OR CONCURRED WITH SUBMITTALS

Do not construe the Contracting Officer's approval of or concurrence with submittals as a complete check, but only that design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or concurrence will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. The Government won’t consider re-submittals for the purpose of substituting previously approved materials or equipment unless accompanied by an explanation of why a substitution is necessary.

1.5. DISAPPROVED SUBMITTALS

Make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Resubmit any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, provide prompt notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

1.6. WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

1.7. GENERAL

Make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, the Contractor’s Quality Control (CQC) System Manager and the Designer of Record, if applicable, shall check, approve, sign, and stamp all items, indicating action taken. Clearly idenify proposed deviations from the contract requirements. Include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Schedule and make submittals requiring Government approval prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples remaining upon completion of the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

1.8. SUBMITTAL REGISTER (GA)

Develop a complete list of submittals, including each separate design package submittal. Submit the initial submittal register within 15 days after Notice to Proceed, including, as a minimum, the design packages and other initial submittals required elsewhere in the contract. The Designer of Record shall identify required submittals in the

specifications, and use the list to prepare the Submittal Register, utilizing the government-provided software, QCS (see Section 01 45 01.10), to create the ENG Form 4288. Appendix Ris a preliminary submittal register input form for use with the Quality Management System and the Resident Office Management System (QCS and RMS). The Government will provide the Contractor the actual Excel Spreadsheet version of this sample input form after award to modify and to use for input into QCS. The Excel Spreadsheet is not totally inputable into QCS, so additional keystroke input will be necessary. The sample input form is not all-inclusive. In addition, additional submittals may be required by other parts of the contract. After award, the parties will meet to discuss contract specific (or task order specific for a task order contract) distribution for the submittals all-inclusive and additional submittals may be required by other parts of the contract. Develop and complete the submittal register as the design is completed. Submit it to the Contracting Officer with the un-reviewed final design package submission or as soon as the design specifications are completed, if before the final design submission. When applicable, if the Contractor elects to fast track design and construction, using multiple design package submissions,update the submittal register to reflect the submittals associated with each design submission, clearly denoting all revisions to the previous submission. The submittal register serves as a scheduling document for submittals and for control of submittal actions throughout the contract period. Coordinate the submit dates and need dates used in the submittal register with dates in the Contractor prepared progress schedule. Submit montly updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates or until all submittals have been satisfactorily completed. Revise and submit the submittal register when revising the progress schedule.

1.9. SCHEDULING

Schedule submittals covering component items forming a system or items that are interrelated to be coordinated and submitted concurrently. Schedule certifications to be submitted with the pertinent drawings. Allow adequate time (a minimum of 15 calendar days exclusive of mailing time) and show on the register for those items requiring Government approval or concurrence. No delay damages or time extensions will be allowed for time lost in late submittals by the Contractor.

1.10. TRANSMITTAL FORM (ENG FORM 4025)

Use the transmittal form (ENG Form 4025) for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor or are included in the QCS software if the Contractor is required to use QCS for this contract. Use a separate transmittal form for each specification section Complete this form by filling out all the heading blank spaces and identify each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

1.11. SUBMITTAL PROCEDURES

Make submittals as follows:

1.11.1. Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Post-Award Conference.

1.11.2. Deviations

For submittals which include proposed deviations requested by the Contractor, check the column "variation" of ENG Form 4025. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

1.12. CONTROL OF SUBMITTALS

Carefully control his procurement operations to ensure that each individual submittal is made on or before the scheduled submittal date shown on the approved "Submittal Register."

1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred.. The Government will retain zero(0) copies of the submittal and return zero(0) copy(ies) of the submittal.

1.14. INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. The Government will retain zero(0) copies of information only submittals.

1.15. STAMPS

Use stamps similar to the following on the submittal data to certify that the submittal meets contract requirements:

CONTRACTOR

(FIRM NAME)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheet(s)

Signature: _____

Title: _____

Date: _____

For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.

SECTION 01 33 16
DESIGN AFTER AWARD

1.0 GENERAL INFORMATION

1.1. INTRODUCTION

1.2. DESIGNER OF RECORD

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. PRE-WORK ACTIVIES & CONFERENCES

3.1.1. Design Quality Control Plan

3.1.2. Post Award Conference

3.1.3. Partnering & Project Progress Processes

3.1.4. Initial Design Conference

3.1.5. Pre-Construction Conference

3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

3.2.1. Site/Utilities

3.2.2. Interim Design Submittals

3.2.3. Over-the-Shoulder Progress Reviews

3.2.4. Final Design Submissions

3.2.5. Design Complete Submittals

3.2.6. Holiday Periods for Government Review or Actions

3.2.7. Late Submittals and Reviews

3.3. DESIGN CONFIGURATION MANAGEMENT

3.3.1. Procedures

3.3.2. Tracking Design Review Comments

3.3.3. Design and Code Checklists

3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

3.4.1. General

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1.0 GENERAL INFORMATION

1.1. INTRODUCTION

1.1.1. The information contained in this section applies to the design required after award. After award, the Contractor will develop the accepted proposal into the completed design, as described herein.

1.1.2. The Contractor may elect to fast track the design and construction that is, proceed with construction of parts of the sitework and facilities prior to completion of the overall design. To facilitate fast tracking, the Contractor may elect to divide the design into no more than ten (10) design packages per major facility type and no more than three (3) design packages for site and associated work. Designate how it will package the design, consistent with its overall plan for permitting (where applicable) and construction of the project. See Sections 01 33 00 SUBMITTAL PROCEDURES and 01 32 01.00 10 PROJECT SCHEDULE for requirements for identifying and scheduling the design packaging plan in the submittal register and project schedule. See also Sections 01 10 00 STATEMENT OF WORK and 01 57 20.00 10 ENVIRONMENTAL PROTECTION for any specified permit requirements. If early procurement of long-lead item construction materials or installed equipment, prior to completion of the associated design package, is necessary to facilitate the project schedule, also identify those long-lead items and how it will assure design integrity of the associated design package to meet the contract requirements (The Contract consists of the Solicitation requirements and the accepted proposal). Once the Government is satisfied that the long-lead items meet the contract requirements, the Contracting Officer will allow the Contractor to procure the items at its own risk.

1.1.3. The Contractor may proceed with the construction work included in a separate design package after the Government has reviewed the final (100%) design submission for that package, review comments have been addressed and resolved to the Government's satisfaction and the Contracting Officer (or the Administrative Contracting Officer) has agreed that the design package may be released for construction.

1.1.4. INTEGRATED DESIGN. To the maximum extent permitted for this project, use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for siting, energy, water, materials and indoor environmental quality and ensures incorporation of these goals. Consider all stages of the building lifecycle, including deconstruction.

1.2. DESIGNER OF RECORD

Identify, for approval, the Designer of Record (“DOR”) that will be responsible for each area of design. One DOR may be responsible for more than one area. Listed, Professional Registered, DOR(s) shall account for all areas of design disciplines shall be accounted for by a listed. The DOR’s shall stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage (see contract clause Registration of Designers). If the deliverables are not ready for release for construction, identify them as "preliminary" or "not for release for construction" or by using some other appropriate designation. The DOR(s) shall also be responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional designer responsibilities.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. PRE-WORK ACTIVITIES & CONFERENCES

3.1.1. Design Quality Control Plan

Submit for Government acceptance, a Design Quality Control Plan in accordance with Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL before design may proceed.

3.1.2. Post Award Conference

3.1.2.1. The government will conduct a post award contract administration conference at the project site, as soon as possible after contract award. This will be coordinated with issuance of the contract notice to proceed (NTP). The Contractor and major sub-contractor representatives shall participate. All designers need not attend this first meeting. Government representatives will include COE project delivery team members, facility users, facility command representatives, and installation representatives. The Government will provide an agenda, meeting goals, meeting place, and meeting time to participants prior to the meeting.

3.1.2.2. The post award conference shall include determination and introduction of contact persons, their authorities, contract administration requirements, discussion of expected project progress processes, and coordination of subsequent meetings for quality control (see Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL), Partnering (see below and SCR: Partnering), and the initial design conference (see below).

3.1.2.3. The government will introduce COE project delivery team members, facility users, facility command representatives, and installation representatives. The DB Contractor shall introduce major subcontractors, and other needed staff. Expectations and duties of each person shall be defined for all participants. A meeting roster shall be developed and distributed by the government with complete contact information including name, office, project role, phone, mailing and physical address, and email address.

3.1.3. Partnering & Project Progress Processes

3.1.3.1. The initial Partnering conference may be scheduled and conducted at any time with or following the post award conference. The Government proposes to form a partnership with the DB Contractor to develop a cohesive building team. This partnership will involve the COE project delivery team members, facility users, facility command representatives, installation representatives, Designers of Record, major subcontractors, contractor quality control staff, and contractor construction management staff. This partnership will strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership will be bilateral in membership and participation will be totally voluntary. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs. Normally, partnering meetings will be held at or in the vicinity of the project installation.

3.1.3.2. As part of the partnering process, the Government and Contractor shall develop, establish, and agree to comprehensive design development processes including conduct of conferences, expectations of design development at conferences, fast-tracking, design acceptance, Structural Interior Design (SID)/ Furniture, Fixtures & Equipment (FF&E) design approval, project closeout, etc. The government will explain contract requirements and the DB Contractor shall review their proposed project schedule and suggest ways to streamline processes.

3.1.4. Initial Design Conference

The initial design conference may be scheduled and conducted at the project installation any time after the post award conference, although it is recommended that the partnering process be initiated with or before the initial design conference. Any design work conducted after award and prior to this conference should be limited to site and is discouraged for other items. All Designers of Record shall participate in the conference. The purpose of the meeting is to introduce everyone and to make sure any needs the contractor has are assigned and due dates established as well as who will get the information. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning the BIM Implementation Plan demonstration at this meeting. The DB Contractor shall conduct the initial design conference.

3.1.5. Pre-Construction Conference

Before starting construction activities, the Contractor and Government will jointly conduct a pre-construction administrative conference to discuss any outstanding requirements and to review local installation requirements for start of construction. It is possible there will be multiple Pre-Construction Conferences based on the content of the design packages selected by the Contractor. The Government will provide minutes of this meeting to all participants.

3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

The stages of design submittals described below define Government expectations with respect to process and content. The Contractor shall determine how to best plan and execute the design and review process for this project, within the parameters listed below. As a minimum, the Government expects to see at least one interim design submittal, at least one final design submittal before construction of a design package may proceed and at least one Design Complete submittal that documents the accepted design. The Contractor may sub-divide the design into separate packages for each stage of design and may proceed with construction of a package after the Government accepts the final design for that package. See discussion on waivers to submission of one or more intermediate design packages where the parties partner during the design process. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning BIM and the various stages of design submittals and over-the-shoulder progress reviews**.**

3.2.1. Site/Utilities

To facilitate fast-track design-construction activities the contractor may submit a final (100%) site and utility design as the first design submittal or it may elect to submit interim and final site and utility design submittals as explained below. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, after completing all other pre-construction requirements in this contract and after the pre-construction meeting, the Government will allow the Contractor to proceed with site development activities, including demolition where applicable, within the parameters set forth in the accepted design submittal. For the first site and utility design submission, whether an interim or final, the submittal review, comment, and resolution times from this specification apply, except that the Contractor shall allow the Government a 14 calendar day review period, exclusive of mailing time. No on-site construction activities shall begin prior to written Government clearance to proceed.

3.2.2. Interim Design Submittals

The Contractor may submit either a single interim design for review, representing a complete package with all design disciplines, or split the interim design into smaller, individual design packages as it deems necessary for fast-track construction purposes. As required in Section 01 32 01.00 10 PROJECT SCHEDULE, the Contractor shall schedule its design and construction packaging plan to meet the contract completion period. This submission is the Government's primary opportunity to review the design for conformance to the solicitation and to the accepted contract proposal and to the Building Codes at a point where required revisions may be still made, while minimizing lost design effort to keep the design on track with the contract requirements. The requirements for the interim design review submittals and review conferences are described hereinafter. This is not necessarily a hold point for the design process; the Contractor may designate the interim design submittal(s) as a snapshot and proceed with design development at its own risk. See below for a waiver, where the parties establish an effective over-the-shoulder progress review procedure through the partnering process that would eliminate the need for or expedite a formal intermediate design review on one or more individual design packages.

3.2.3. Over-the-Shoulder Progress Reviews

To facilitate a streamlined design-build process, the Government and the Contractor may agree to one-on-one reviewer or small group reviews, electronically, on-line (if available within the Contractor's standard design practices) or at the Contractor's design offices or other agreed location, when practicable to the parties. The Government and Contractor will coordinate such reviews to minimize or eliminate disruptions to the design process. Any data required for these reviews shall normally be provided in electronic format, rather than in hard copy. If the Government and Contractor establish and implement an effective, mutually agreeable partnering procedure for regular (e.g., weekly) over-the shoulder review procedures that allow the Government reviewers the opportunity to keep fully informed of the progress, contents, design intent, design documentation, etc. of the design package, the Government will agree to waive or to expedite the formal intermediate design review period for that package. The Contractor shall still be required to submit the required intermediate design documentation, however the parties may agree to how that material will be provided, in lieu of a formal consolidated submission of the package. It should be noted that Government funding is extremely limited for non-local travel by design reviewers, so the maximum use of virtual teaming methods must be used. Some possible examples include electronic file sharing, interactive software with on-line or telephonic conferencing, televideo conferencing, etc. The Government must still perform its Code and Contract conformance reviews, so the Contractor is encouraged to partner with the reviewers to find ways to facilitate this process and to facilitate meeting or bettering the design-build schedule. The Contractor shall maintain a fully functional configuration management system as described herein to track design revisions, regardless of whether or not there is a need for a formal intermediate design review. The formal intermediate

review procedures shall form the contractual basis for the official schedule, in the event that the partnering process determines that the formal intermediate review process to be best suited for efficient project execution. However, the Government pledges to support and promote the partnering process to work with the Contractor to find ways to better the design schedule.

3.2.4. Final Design Submissions

This submittal is required for each design package prior to Government acceptance of that design package for construction. The requirements for the final design submittal review conferences and the Government's acceptance for start of construction are described herein after.

3.2.5. Design Complete Submittals

After the final design submission and review conference for a design package, revise the design package to incorporate the comments generated and resolved in the final review conferences, perform and document a back-check review and submit the final, design complete documents, which shall represent released for construction documents. The requirements for the design complete submittals are described hereinafter.

3.2.6. Holiday Periods for Government Review or Actions

Do not schedule meetings, Government reviews or responses during the last two weeks of December or other designated Government Holidays (including Friday after Thanksgiving). Exclude such dates and periods from any durations specified herein for Government actions.

3.2.7. Late Submittals and Reviews

If the Contractor cannot meet its scheduled submittal date for a design package, it must revise the proposed submittal date and notify the government in writing, at least one (1) week prior to the submittal, in order to accommodate the Government reviewers' other scheduled activities. If a design submittal is over one (1) day late in accordance with the latest revised design schedule, or if notification of a proposed design schedule change is less than seven (7) days from the anticipated design submission receipt date, the Government review period may be extended up to seven (7) days due to reviewers' schedule conflicts. If the Government is late in meeting its review commitment and the delay increases the Contractor's cost or delays completion of the project, the Suspension of Work and Defaults clauses provide the respective remedy or relief for the delay.

3.3. DESIGN CONFIGURATION MANAGEMENT

3.3.1. Procedures

Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. During the design process, this will facilitate and help streamline the design and review schedule. After the final design is accepted, this process provides control of and documents revisions to the accepted design (See Special Contract Requirement: Deviating From the Accepted Design). The system shall include appropriate authorities and concurrences to authorize revisions, including documentation as to why the revision must be made. The DCM data shall be available to the Government reviewers at all times. The Contractor may use its own internal system with interactive Government concurrences, where necessary or may use the Government's "DrChecks Design Review and Checking System" (see below and Attachment C).

3.3.2. Tracking Design Review Comments

Although the Contractor may use its own internal system for overall design configuration management, the Government and the Contractor shall use the DrChecks Design Review and Checking System to initiate, respond to, resolve and track Government design compliance review comments. This system may be useful for other data which needs to be interactive or otherwise available for shared use and retrieval. See Attachment C for details on how to establish an account and set-up the DrChecks system for use on the project.

3.3.3. Design and Code Checklists

Develop and complete various discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists with each design submittal, as applicable, as part of the project documentation. See Section 01 45 04.00 10 Contractor Quality Control, Attachment D for a Sample Fire Protection and Life Safety Code review checklist and Attachment E for LEED SUBMITTALS.

3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

3.4.1. General

At least one interim design submittal, review and review conference is required for each design package (except that, per paragraph 3.2.1, the Contractor may skip the interim design submission and proceed directly to final design on the sitework and utilities package). The DB Contractor may include additional interim design conferences or over-the-shoulder reviews, as needed, to assure continued government concurrence with the design work. Include the interim submittal review periods and conferences in the project schedule and indicate what part of the design work is at what percentage of completion. The required interim design conferences shall be held when interim design requirements are reached as described below. See also Paragraph: **Over-the-Shoulder Progress Reviews** for a waiver to the formal interim design review.

3.4.2. Procedures

After receipt of an Interim Design submission, allow the Government fourteen (14) calendar days after receipt of the submission to review and comment on the interim design submittal. For smaller design packages, especially those that involve only one or a few separate design disciplines, the parties may agree on a shorter review period or alternative review methods (e.g., over-the–shoulder or electronic file sharing), through the partnering process. For each interim design review submittal, the COR will furnish, to the Contractor, a single consolidated, validated listing of all comments from the various design sections and from other concerned agencies involved in the review process using the DrChecks Design Review and Checking System. The review will be for conformance with the technical requirements of the solicitation and the Contractor's RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she must clearly outline, with ample justification, the reasons for noncompliance within five (5) days after receipt of these comments in order that the comment can be resolved. Furnish disposition of all comments, in writing, through DrChecks. The Contractor is cautioned that if it believes the action required by any comment exceeds the requirements of this contract, that it should take no action and notify the COR in writing immediately. The Interim Review conference will be held for each design submittal at the installation. Bring the personnel that developed the design submittal to the review conference. The conference will take place the week after the receipt of the comments by the Contractor. For smaller fast-track packages that involve only a few reviewers, the parties may agree to alternative conferencing methods, such as teleconferencing, or televideo, where available, as determined through Partnering.

3.4.3. Conference Documentation

3.4.3.1. In order to facilitate and accelerate the Government code and contract conformance reviews, identify, track resolution of and maintain all comments and action items generated during the design process and make this available to the designers and reviewers prior to the Interim and subsequent design reviews.

3.4.3.2. The DB Contractor shall prepare meeting minutes and enter final resolution of all comments into DrChecks. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Incorporate valid comments. The Government reserves the right to reject design document submittals if comments are significant. Participants shall determine if any comments are critical enough to require further design development prior to government concurrence. Participants shall also determine how to proceed in order to obtain government concurrence with the design work presented.

3.5. INTERIM DESIGN REQUIREMENTS

Interim design deliverables shall include drawings, specifications, and design analysis for the part of design that the Contractor considers ready for review.

3.5.1. Drawings

Include comments from any previous design conferences incorporated into the documents to provide an interim design for the “part” submitted.

3.5.2. Design Analyses

3.5.2.1. The designers of record shall prepare and present design analyses with calculations necessary to substantiate and support all design documents submitted. Address design substantiation required by the applicable codes and references and pay particular attention to the following listed items:

3.5.2.2. For parts including sitework, include site specific civil calculations.

3.5.2.3. For parts including structural work, include structural calculations.

(a) Identify all loads to be used for design.

(b) Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

(c) Provide calculations for all principal roof, floor, and foundation members and bracing and secondary members.

(d) Provide complete seismic analyses for all building structural, mechanical, electrical, architectural, and building features as dictated by the seismic zone for which the facility is being constructed.

(e) Computer generated calculations must identify the program name, source, and version. Provide input data, including loads, loading diagrams, node diagrams, and adequate documentation to illustrate the design. The schematic models used for input must show, as a minimum, nodes/joints, element/members, materials/properties, and all loadings, induced settlements/deflections, etc., and a list of load combinations. Include an output listing for maximum/minimum stresses/forces and deflections for each element and the reactions for each loading case and combination.

(f) See also the Security (Anti-Terrorism) requirements below for members subject to Anti-Terrorist Force Protection (ATFP) and Progressive Collapse requirements.

(g) Fully coordinate and integrate the overall structural design between two different or interfacing construction types, such as modular and stick-built or multistory, stacked modular construction. Provide substantiation of structural, consolidation/settlement analysis, etc., as applicable, through the interfaces.

3.5.2.4. For Security (Anti-Terrorism): Provide a design narrative and calculations where applicable, demonstrating compliance with each of the 22 standards in UFC 4-010-01, which includes Design of Buildings to Resist Progressive Collapse (use the most recent version of UFC 4-023-03, regardless of references to any specific version in UFC 4-010-01). Where sufficient standoff distance is not being provided, show calculations for blast resistance of the structural system and building envelope. Show complete calculations for members subjected to ATFP loads, e.g., support members of glazed items (jambs, headers, sills) connections of windows to support members and connections of support members to the rest of the structure. For 3 story and higher buildings, provide calculations to demonstrate compliance with progressive collapse requirements.

3.5.2.5. For parts including architectural work, include building floor area analysis.

3.5.2.6. For parts including mechanical work, include HVAC analysis and calculations. Include complete design calculations for mechanical systems. Include computations for sizing equipment, compressed air systems, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation is required (see paragraph 3.5.5.2 for list of acceptable software). Based on the results of calculations, provide a complete list of the materials and equipment proposed with the manufacturer's published cataloged product installation specifications and roughing-in data.

3.5.2.7. For parts including life safety, include building code analysis and sprinkler and other suppression systems. Notwithstanding the requirements of the Codes, address the following:

(a) A registered fire protection engineer (FPE) must perform all fire protection analyses. Provide the fire protection engineer’s qualifications. See Section 01 10 00, paragraph 5 for qualifications.

(b) Provide all references used in the design including Government design documents and industry standards used to generate the fire protection analysis.

(c) Provide classification of each building in accordance with fire zone, building floor areas and height and number of stories.

(d) Provide discussion and description of required fire protection requirements including extinguishing equipment, detection equipment, alarm equipment and water supply. Alarm and detection equipment shall interface to requirements of Electronic Systems.

(e) Provide hydraulic calculations based on water flow test for each sprinkler system to insure that flow and pressure requirements can be met with current water supply. Include copies of Contractor's water flow testing done to certify the available water source.

3.5.2.8. For parts including plumbing systems:

(a) List all references used in the design.

(b) Provide justification and brief description of the types of plumbing fixtures, piping materials and equipment proposed for use.

(c) Detail calculations for systems such as sizing of domestic hot water heater and piping; natural gas piping; LP gas piping and tanks, fuel oil piping and tanks, etc., as applicable.

(d) When the geotechnical report indicates expansive soils are present, indicate in the first piping design submittal how piping systems will be protected against damage or backfall/backflow due to soil heave (from penetration of slab to the 5 foot building line).

3.5.2.9. For elevator systems:

(a) List all criteria codes, documents and design conditions used.

(b) List any required permits and registrations for construction of items of special mechanical systems and equipment.

3.5.2.10. For parts including electrical work, include lighting calculations to determine maintained foot-candle levels, electrical load analysis and calculations, electrical short circuit and protective device coordination analysis and calculations and arc fault calculations.

3.5.2.11. For parts including telecommunications voice/data (including SIPRNET, where applicable), include analysis for determining the number and placement of outlets

3.5.2.12. For Cathodic Protection Systems, provide the following stamped report by the licensed corrosion engineer or NACE specialist with the first design submission. The designer must be qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. He/she must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection Specialist, or must be a registered professional engineer with a minimum of five years experience in corrosion control and cathodic protection, Clearly describe structures, systems or components in soil or water to be protected. Describe methods proposed for protection of each.

3.5.3. Geotechnical Investigations and Reports:

3.5.3.1. The contractor’s licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal. Make this information available as early as possible during the over-the-shoulder progress review process. Summarize the subsurface conditions and provide recommendations for the design of appropriate utilities, foundations, floor slabs, retaining walls, embankments, and pavements. Include compaction requirements for fill and backfill under buildings, sidewalks, other structures and open areas. Recommend foundation systems to be used, allowable bearing pressures for footings, lateral load resistance capacities for foundation systems, elevations for footings, grade beams, slabs, etc. Provide an assessment of post-construction settlement potential including total and differential. Provide recommendations regarding lateral earth pressures (active, at-rest, passive) to be used in the design of retaining walls. Include the recommended spectral accelerations and Site Class for seismic design along with an evaluation of any seismic hazards and recommendations for mitigation, if required. Include calculations to support the recommendations for bearing capacity, settlement, and pavement sections. Include supporting documentation for all recommended

design parameters such as Site Class, shear strength, earth pressure coefficients, friction factors, subgrade modulus, California Bearing Ratio (CBR), etc. Provide earthwork recommendations, expected frost penetration, expected groundwater levels, recommendations for dewatering and groundwater control and the possible presence of any surface or subsurface features that may affect the construction of the project such as sinkholes, boulders, shallow rock, old fill, old structures, soft areas, or unusual soil conditions. Include pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. Include the raw field data. Arrange a meeting with the Government subsequent to completion and evaluation of the site specific geotechnical exploration to outline any differences encountered that are inconsistent with the Government provided preliminary soils information. Clearly outline differences which require changes in the foundation type, or pavement and earthwork requirements from that possible and contemplated using the Government furnished preliminary soils investigation, which result in a change to the design or construction. Any equitable adjustment is subject to the provisions of the contract's Differing Site Conditions Clause.

3.5.3.2. Vehicle Pavements: The Contractor's geotechnical report shall contain flexible and rigid pavement designs, as applicable for the project, including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades and pavement layers. Provide Information on the types of base course materials available in the area and design strengths.

3.5.3.3. The Contractor and the professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the Contractor's final geotechnical report. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the first design submission. If revisions are made to the initial design submission, a new certification shall be provided with the final design submission.

3.5.4. LEED Documentation:

Assign a LEED Accredited Professional, responsible to track LEED planning, performance and documentation for each LEED credit through construction closeout. Incorporate LEED credits in the plans, specifications and design analyses. Develop LEED supporting documentation as a separable portion of the Design Analysis and provide with each required design submittal. Include the LEED Project checklist for each non-exempt facility (one checklist may be provided for multiple facilities in accordance with the LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects and the LEED SUBMITTALS (Attachment E, herein) with each submittal. Final design submittal for each portion of the work must include all required design documentation relating to that portion of work (example - all site credit design documents with final site design). Submittal requirements are as indicated in Attachment E, LEED SUBMITTALS. Submit all documentation indicated on Attachment E as due at final design at final design submittal (for fast-track projects with multiple final design submittals, this shall be at the last scheduled final design submittal). All project documentation related to LEED shall conform to USGBC requirements for both content and format, including audit requirements and be separate from other design analyses. Maintain and update the LEED documentation throughout project progress to construction closeout and shall compile product data, receipts, calculations and other data necessary to substantiate and support all credits claimed. The Government may audit any or all individual credits. Audit documentation is not required to be submitted unless requested. These requirements apply to all projects. If the project requires the Contractor to obtain USGBC certification, the Contractor shall also be responsible for obtaining USGBC certification and shall provide written evidence of certification with the construction closeout LEED documentation submittal. Install the USGBC building plaque at the location indicated by the Government upon receipt. If Contractor obtains USGBC interim design review, submit the USGBC review to the Government within 30 days of receipt for information only.

3.5.4.1. LEED Documentation for Technology Solution Set. If the Solicitation provides a Prescriptive Technology Solution Set, use of the Technology Solution set has no effect on LEED documentation requirements. Provide all required LEED documentation, including energy analysis, in accordance with LEED requirements when using the Technology Solution Set.

3.5.5. Energy Conservation:

3.5.5.1. Refer to Section 01 10 00, Paragraph 5. Interim and Final Design submittals shall demonstrate that each building including the building envelope, HVAC systems, service water heating, power, and lighting systems meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Use Compliance Documentation forms available from ASHRAE and included in the ASHRAE 90.1 User's Manual for this purpose. The Architectural Section of the Design Analysis shall include completed forms titled "Building Envelope

Compliance Documentation Parts I and II". The Heating Ventilating and Air Conditioning (HVAC) Section of the Design Analysis shall include a completed form titled "HVAC Simplified Approach Option - Part I" if this approach is allowed by the Standard. Otherwise, the HVAC Section of the Design Analysis shall include completed forms titled "HVAC Mandatory Provisions - Part II" and "HVAC Prescriptive Requirements - Part III". The Plumbing Section of the Design Analysis shall include a completed form titled "Service Water Heating Compliance Documentation". The Electrical Section of the Design Analysis shall include an explanatory statement on how the requirements of ASHRAE 90.1-2004 Chapter 8 Power were met. The Electrical Section of the Design Analysis shall also include a completed form titled "Lighting Compliance Documentation".

3.5.5.2. Interim and Final Design submittals which address energy consuming systems, (heating, cooling, service hot water, lighting, power, etc.) must also include calculations in a separate Energy Conservation Section of the Design Analysis which demonstrate and document (a) the baseline energy consumption for the facility or facilities under contract, that would meet the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and (b) the energy consumption of the facility or facilities under contract utilizing the materials and methods required by this construction contract. Use the USGBC Energy and Atmosphere (EA) Credit 1 compliance template / form or an equivalently detailed form for documenting compliance with the energy reduction requirements. This template / form is titled PERFORMANCE RATING METHOD and is available when the project is registered for LEED. The calculation methodology used for this documentation and analysis shall follow the guidelines set forth in Appendix G of ASHRAE 90.1, with two exceptions: a) receptacle and process loads may be omitted from the calculation; and b) the definition of the terms in the formula for Percentage Improvement found in paragraph G1.2 are modified as follows: Baseline Building Performance shall mean the annual energy consumption calculated for a building design intended for use as a baseline for rating above standard design meeting the minimum requirements of the energy standard, and Proposed Building Performance shall mean annual energy consumption calculated for the proposed building design intended for construction. This calculation shall address all energy consuming systems in a single integrated methodology. Include laboratory fume hoods and kitchen ventilation loads in the energy calculation. They are not considered process loads. Individual calculations for heating, cooling, power, lighting, power, etc. systems will not be acceptable. The following building simulation software is acceptable for use in calculating building energy consumption: Hourly Analysis Program (HAP) by Carrier Corp., TRACE 700 by Trane Corp., DOE-2 by US Department of Energy, EnergyPlus by DOD/DOE.

3.5.6. Specifications

Specifications may be any one of the major, well known master guide specification sources (use only one source) such as MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facility Guide Specifications (UFGS using MASTERFORMAT 2004 numbering system), etc. (including specifications from these sources). Manufacturers' product specifications, utilizing CSI's Manu-Spec, three part format may be used in conjunction with the selected specifications. The designers of record shall edit and expand the appropriate Specifications to insure that all project design requirements, current code requirements, and regulatory requirements are met. Specifications shall clearly identify, where appropriate, specific products chosen to meet the contract requirements (i.e., manufacturers' brand names and model numbers or similar product information).

3.5.7. Building Rendering

Present and provide a draft color computer, artist, or hand drawn rendering with the conceptual design submittal of the building exterior. Perspective renderings shall include a slightly overhead view of the entire building to encompass elevations and the roof configuration of the building. After Government review and acceptance, provide a final rendering, including the following:

Three (3) 18" x 24" color prints, framed and matted behind glass with project title underneath the print.

One (1) Image file (high resolution) in JPG format on CD for those in the submittal distribution list.

3.5.8. Interim Building Design Contents

The following list represents what the Government considers should be included in the overall completed design for a facility or project. It is not intended to limit the contractor from providing different or additional information as needed to support the design presented, including the require design analyses discussed above. As the Contractor develops individual design packages and submits them for Interim review, include as much of the applicable

information for an individual design package as is developed at the Interim design level for review purposes. These pieces shall be developed as the design progresses toward the design complete stage.

3.5.8.1. Lawn and Landscaping Irrigation System

3.5.8.2. Landscape, Planting and Turfing

3.5.8.3. Architectural

(a) Design Narrative

(b) Architectural Floor Plans, Typical Wall and Roof Sections, Elevations

(c) Finish schedule

(d) All required equipment

(e) Special graphics requirements

(f) Door and Window Schedules

(g) Hardware sets using BHMA designations

(h) Composite floor plan showing all pre-wired workstations

(i) Structural Interior Design (SID) package: See ATTACHMENT A for specific requirements

(j) Furniture, Fixtures & Equipment (FF&E) design package: See ATTACHMENT B for specific requirements

3.5.8.4. Structural Systems. Include:

(a) Drawings showing principal members for roof and floor framing plans as applicable

(b) Foundation plan showing main foundation elements where applicable

(c) Typical sections for roof, floor, and foundation conditions

3.5.8.5. Plumbing Systems

(a) Show locations and general arrangement of plumbing fixtures and major equipment

(b) Plan and isometric riser diagrams of all areas including hot water, cold water, waste and vent piping. Include natural gas (and meter as required), (natural gas and meter as required), (LP gas), (fuel oil) and other specialty systems as applicable.

(c) Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required

3.5.8.6. HVAC Systems

(a) Mechanical Floor Plans: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:

(1) Room designations.

(2) Mechanical legend and applicable notes.

(3) Location and size of all ductwork and piping.

(4) Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards).

(5) Pre-Fabricated Paint Spray Booth (where applicable to project scope)

(6) Paint Preparation Area (where applicable to project scope)

(7) Exhaust fans and specialized exhaust systems.

(8) Thermostat location.

(9) Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).

(10) Location of all air handling equipment.

(11) Air balancing information.

(12) Flue size and location.

(13) Piping diagram for forced hot water system (if used).

(b) Equipment Schedule: Provide complete equipment schedules. Include:

(1) Capacity

(2) Electrical characteristics

(3) Efficiency (if applicable)

(4) Manufacturer's name

(5) Optional features to be provided

(6) Physical size

(7) Minimum maintenance clearances

(a) Details: Provide construction details, sections, elevations, etc., only where required for clarification of methods and materials of design.

(b) HVAC Controls: Submit complete HVAC controls equipment schedules, sequences of operation, wiring and logic diagrams, Input/Output Tables, equipment schedules, and all associated information. See the Statement of Work for additional specific requirements.

3.5.8.7. Fire Protection and Life Safety.

(a) Provide plan for each floor of each building that presents a compendium of the total fire protection features being incorporated into the design. Include the following types of information:

(1) The location and rating of any fire-resistive construction such as occupancy separations, area separations, exterior walls, shaft enclosures, corridors, stair enclosures, exit passageways, etc.

(2) The location and coverage of any fire detection systems

(3) The location and coverage of any fire suppression systems (sprinkler risers, standpipes, etc.)

(4) The location of any other major fire protection equipment

(5) Indicate any hazardous areas and their classification

(6) Schedule describing the internal systems with the following information: fire hazard and occupancy classifications, building construction type, GPM/square foot sprinkler density, area of operation and other as required

(b) Working plans and all other materials submitted shall meet NFPA 13 requirements, with respect to required minimum level of detail.

3.5.8.8. Elevators. Provide:

(a) Description of the proposed control system

(b) Description, approximate capacity and location of any special mechanical equipment for elevators.

3.5.8.9. Electrical Systems.

(a) Electrical Floor Plan(s): Show all principle architectural features of the building which will affect the electrical design. Show the following:

(1) Room designations.

(2) Electrical legend and applicable notes.

(3) Lighting fixtures, properly identified.

(4) Switches for control of lighting.

(5) Receptacles.

(6) Location and designation of panelboards. Clearly indicate type of mounting required (flush or surface) and reflect accordingly in specifications.

(7) Service entrance (conduit and main disconnect).

(8) Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.

(b) Building Riser Diagram(s) (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

(c) Load Center Panelboard Schedule(s): Indicate the following information:

(1) Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting.

(2) Branch Circuit Designations.

(3) Load Designations.

(4) Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)

(5) Branch Circuit Connected Loads (AMPS).

(6) Special Features

(d) Lighting Fixture Schedule(s): Indicate the following information:

(1) Fixture Designation.

(2) General Fixture Description.

(3) Number and Type of Lamp(s).

(4) Type of Mounting.

(5) Special Features.

(e) Details: Provide construction details, sections, elevations, etc. only where required for clarification of methods and materials of design.

3.5.8.10. Electronic Systems including the following responsibilities:

(a) Fire Detection and Alarm System. Design shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.)

(b) Fire Suppression System Control. Specify all components of the Fire Suppression (FS) System in the FS section of the specifications. Clearly describe how the system will operate and interact with other systems such as the fire alarm system. Include a riser diagram on the drawings showing principal components and interconnections with other systems. Include FS system components on drawing legend. Designate all components shown on floor plans “FS system components” (as opposed to “Fire Alarm components”). Show location of FS control panels, HVAC control devices, sensors, and 120V power panel connections on floor plans. Indicate zoning of areas by numbers (1, 2, 3) and detectors sub-zoned for cross zoning by letter designations (A and B). Differentiate between ceiling mounted and under floor detectors with distinct symbols and indicate sub-zone of each.

(c) Public Address System

(d) Special Grounding Systems. Completely reflect all design requirements in the specifications and drawings. Specifications shall require field tests (in the construction phase), witnessed by the Government, to determine the effectiveness of the grounding system. Include drawings showing existing construction, if any.

(e) Cathodic Protection.

(f) Intrusion Detection, Card Access System

(g) Central Control and Monitoring System

(h) Mass Notification System

(i) Electrical Power Distribution Systems

3.5.8.11. Information Systems including the following responsibilities:

(a) Telecommunications Cabling

(b) Supporting Infrastructure

(a) Outside Plant (OSP) Cabling - Campus or Site Plans - Exterior Pathways and Inter-Building Backbones

(a) Include a layout of the voice/data outlets (including voice only wall & pay phones) on telecommunication floor plan drawing, location of SIPRNET data outlets (where applicable), and a legend and symbol definition to indicate height above finished floor. Show size of conduit and cable type and size on Riser Diagram. Do not show conduit runs between backboard and outlets on the floor plans. Show underground distribution conduit and cable with sizing from point of presence to entrance facility of building.

(b) Layout of complete building per floor - Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways including Serving Zones Drawings - Drop Locations and Cable ID's

(c) Communication Equipment Rooms - Plan Views - Tech and AMEP/Elevations - Racks and Walls. Elevations with a detailed look at all telecomm rooms. Indicate technology layout (racks, ladder-racks, etc.), mechanical/electrical layout, rack elevation and backboard elevation. They may also be an enlargement of a congested area of T1 or T2 series drawing.

3.6. FINAL DESIGN REVIEWS AND CONFERENCES

A final design review and review conference will be held upon completion of final design at the project installation, or – where equipment is available - by video teleconference or a combination thereof, for any design package to receive Government acceptance to allow release of the design package for construction. For smaller separate design packages, the parties may agree on alternative reviews and conferences (e.g., conference calls and electronic file sharing, etc.) through the Partnering process. Include the final design conference in the project schedule and shall indicate what part of the design work is at 100% completion. The final design conference will be held after the Government has had seven (7) calendar days after receipt of the submission to review the final design package and supporting data. For smaller packages, especially those involving only one or a few design disciplines the parties may agree on a shorter period.

3.7. FINAL DESIGN REQUIREMENTS

Final design deliverables for a design package shall consist of 100% complete drawings, specifications, submittal register and design analyses for Government review and acceptance. The 100% design submission shall consist of drawings, specifications, updated design analyses and any permits required by the contract for each package submitted. In order to expedite the final design review, prior to the conference, ensure that the design configuration management data and all review comment resolutions are up-to-date. Include the 100% SID and 100% FF&E binders for government approval. The Contractor shall have performed independent technical reviews (ITR's) and back-checks of previous comment resolutions, as required by Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL, including providing documentation thereof.

3.7.1. Drawings

3.7.1.1. Submit drawings complete with all contract requirements incorporated into the documents to provide a 100% design for each package submitted.

3.7.1.2. Prepare all drawings with the Computer-Aided Design and Drafting (CADD)/Computer-Aided Design (CAD) system, organized and easily referenced electronically, presenting complete construction information.

3.7.1.3. Drawings shall be complete. The Contractor is encouraged to utilize graphics, views, notes, and details which make the drawings easier to review or to construct but is also encouraged to keep such materials to those that are necessary.

3.7.1.4. Provide detail drawings that illustrate conformance with the contract. Include room finish schedules, corresponding color/finish/special items schedules, and exterior finish schedules that agree with the submitted SID binders.

3.7.1.5. The design documents shall be in compliance with the latest version of the A/E/C CADD Standard, available at https://cadbim.usace.army.mil/CAD. Use the approved vertical Corps of Engineers title blocks and borders on all drawings with the appropriate firm name included within the title block area.

3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with MicroStation V8 or higher. Save all design CAD files as MicroStation V8 or higher files. All submitted BIM Models and associated Facility Data shall be fully compatible with Bentley BIM file format and the USACE Bentley BIM v8 Workspace.

(a) CAD Data Final File Format: During the design development capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.

(b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.

(c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Drawing files with external references or special fonts are not acceptable. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.

(d) Deliver BIM Model and associated Facility Data files in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.

(e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.

(f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.

3.7.2. Design Analyses

3.7.2.1. The designers of record shall update, finalize and present design analyses with calculations necessary to substantiate and support all design documents submitted.

3.7.2.2. The responsible DOR shall stamp, sign and date the design analysis. Identify the software used where, applicable (name, version, vendor). Generally, provide design analyses, individually, in an original (file copy) and one copy for the assigned government reviewer.

3.7.2.3. All disciplines review the LEED design analysis in conjunction with their discipline-specific design analysis; include a copy of the separable LEED design analysis in all design analysis submittals.

3.7.2.4. Do not combine multi-disciplined volumes of design-analysis, unless multiple copies are provided to facilitate multiple reviewers (one copy per each separate design analysis included in a volume).

3.7.3. Specifications

Specifications shall be 100% complete and in final form.

3.7.4. Submittal Register

Prepare and update the Submittal Register and submit it with the 100% design specifications (see Specification Section 01 33 00, SUBMITTAL PROCEDURES) with each design package. Include the required submittals for each specification section in a design package in the submittal register.

3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

This form itemizes the types, quantities and costs of various equipment and systems that comprise the project, for the purpose of transferring the new construction project from the Corps Construction Division to the Installation's inventory of real property. The Government will furnish the DB Contractor's design manager a DD Form 1354 checklist to use to produce a draft Form 1354. Submit the completed checklist and prepared draft Form DD 1354 with the 100% design in the Design Analysis. The Corps will use these documents to complete the final DD 1354 upon completion of construction.

3.7.6. Acceptance and Release for Construction

3.7.6.1. At the conclusion of the Final Design Review (after resolutions to the comments have been agreed upon between DOR and Government reviewers), the Contracting Officer or the ACO will accept the Final Design Submission for the design package in writing and allow construction to start for that design package. The Government may withhold acceptance until all major corrections have been made or if the final design submission requires so many corrections, even though minor, that it isn't considered acceptably complete.

3.7.6.2. Government review and acceptance of design submittals is for contract conformance only and shall not relieve the Contractor from responsibility to fully adhere to the requirements of the contract, including the Contractor’s accepted contract proposal, or limit the Contractor’s responsibility of design as prescribed under Special Contract Requirement: “Responsibility of the Contractor for Design” or limit the Government’s rights under the terms of the contract. The Government reserves the right to rescind inadvertent acceptance of design submittals containing contract deviations not separately and expressly identified in the submittal for Government consideration and approval.

3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

After the Final Design Submission and Review Conference and after Government acceptance of the Final Design submission, revise the design documents for the design package to incorporate the comments generated and resolved in the final review conference, perform and document a back-check review and submit the final, design complete documents. Label the final design complete documents “FOR CONSTRUCTION” or use similar language. In addition to the final drawings and specifications, the following deliverables are required for distribution and field use. The deliverable includes all documentation and supporting design analysis in final form, as well as the final review comments, disposition and the back-check. As part of the quality assurance process, the Government may perform a back-check of the released for construction documentation. Promptly correct any errors or omissions found during the Government back-check. The Government may withhold retainage from progress payments for work or materials associated with a final design package until this submittal has been received and the Government determines that it is complete.

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

Activity and Address	Drawing Size (Full Size) **Full Size** Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) **1/2 Size** Full Sets/ *Partial Sets	Non-BIM Data CD-ROM or DVD as Necessary (PDF& **.dgn**)	Furniture Submittal (FFE)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Commander, U.S.Army Engineer District **Tulsa**	1/0	7/0	7/0	7	2	2	2
Commander, U.S.Army Engineer District, Center of Standardization **Fort Worth**	1/0	1/0	1/0	6	2	2	2
Installation	0/0	7/0	12/0	12	2	2	1
U.S.Army Corps of Engineers Construction Area Office	1/0	3/0	3/0	4	2	1	1
Information Systems Engineering Command (ISEC)	0/0	0/1	0/0	1	1 (Electronic only)	N/A	1
Other Offices	1/0	1/0	1/0	1	0	0	1

***NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.**

****NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.**

3.9.2. Web based Design Submittals

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically authorized to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

3.9.3. Mailing of Design Submittals

3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to eight (8) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.

3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design, such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

3.10. AS-BUILT DOCUMENTS

Provide as-built drawings and specifications in accordance with Section 01 78 02.00 10, CLOSEOUT SUBMITTALS. Update LEED design phase documentation during construction as needed to reflect construction changes and advancing project completion status (example - Commissioning Plan updates during construction phase) and include updated LEED documentation in construction closeout submittal.

ATTACHMENT A
STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS

1.0 GENERAL INFORMATION

Structural Interior Design includes all building related elements and components generally part of the building itself, such as wall finishes, ceilings finishes, floor coverings, marker/bulletin boards, blinds, signage and built in casework. Develop the SID in conjunction with the furniture footprint.

2.0 STRUCURAL INTERIOR DESIGN (SID) REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

2.1. FORMAT AND SCHEDULE

Prepare and submit for approval an interior and exterior building finishes scheme for an interim design submittal. The DOR shall meet with and discuss the finish schemes with the appropriate Government officials prior to preparation of the schemes to be presented. Present original sets of the schemes to reviewers at an interim design conference.

At the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers, the Contractor may proceed to final design with the interior finishes scheme presented.

The SID information and samples are to be submitted in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover. When there are numerous pages with thick samples, use more than one binder. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Structural Interior Design" package. Include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

2.1.1. Narrative of the Structural Interior Design Objectives

The SID shall include a narrative that discusses the building related finishes. Include topics that relate to base standards, life safety, sustainable design issues, aesthetics, durability and maintainability, discuss the development and features as they relate to the occupants requirements and the building design.

2.1.2. Interior Color Boards

Identify and key each item item on the color boards to the contract documents to provide a clear indication of how and where each item will be used. Arrange finish samples to the maximum extent possible by room type in order to illustrate room color coordination. Label all samples on the color boards with the manufacturer's name, patterns and colors name and number. Key or code samples to match key code system used on contract drawings.

Material and finish samples shall indicate true pattern, color and texture. Provide photographs or colored photocopies of materials or fabrics to show large overall patterns in conjunction with actual samples to show the actual colors. Finish samples must be large enough to show a complete pattern or design where practical.

Color boards shall include but not be limited to original color samples of the following:

All walls finishes and ceiling finishes, including corner guards, acrylic wainscoting and wall guards/chair rail finishes

All tile information, including tile grout color and tile patterns.

- All flooring finishes, including patterns.
- All door, door frame finishes and door hardware finishes
- All signage, wall base, toilet partitions, locker finishes and operable/folding partitions and trim

- All millwork materials and finishes (cabinets, counter tops, etc.)
- All window frame finishes and window treatments (sills, blinds, etc.)

Color board samples shall reflect all actual finish textures, patterns and colors required as specified. Patterned samples shall be of sufficient size to adequately show pattern and its repeat if a repeat occurs.

2.1.3. Exterior Color Boards

Prepare exterior finishes color boards in similar format as the interior finishes color boards, for presentation to the reviewers during an interim design conference. Provide original color samples of all exterior finishes including but not limited to the following:

- All Roof Finishes
- All Brick and Cast Stone Samples
- All Exterior Insulation and Finish Samples
- All Glass Color Samples
- All Exterior Metals Finishes
- All Window & Door Frame Finishes
- All Specialty Item Finishes, including trim

Identify each item on the exterior finishes color boards and key to the building elevations to provide a clear indication of how and where each item will be used.

2.2. STRUCTURAL INTERIOR DESIGN DOCUMENTS

2.2.1. General

Structural interior design related drawings must indicate the placement of extents of SID material, finishes and colors and must be sufficiently detailed to define all interior work. The following is a list of minimum requirements:

2.2.2. Finish Color Schedule

Provide finish color schedule(s) in the contract documents. Provide a finish code, material type, manufacturer, series, and color designations. Key the finish code to the color board samples and drawings.

2.2.3. Interior Finish Plans

Indicate wall and floor patterns and color placement, material transitions and extents of interior finishes.

2.2.4. Furniture Footprint Plans

Provide furniture footprint plans showing the outline of all freestanding and systems furniture for coordination of all other disciplines.

2.2.5. Interior Signage

Include interior signage plans or schedules showing location and quantities of all interior signage. Key each interior sign to a quantitative list indicating size, quantity of each type and signage text.

2.2.6. Interior Elevations, Sections and Details

Indicate material, color and finish placement.

ATTACHMENT B
FURNITURE, FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS

1.0 FF&E REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

1.1. FORMAT AND SCHEDULE

Prepare and submit for approval a comprehensive FF&E scheme for an interim design submittal. The Contractor's interior designer, not a furniture dealer, shall develop the design. FF&E is the selection, layout, specification and documentation of furniture includes but is not limited to workstations, seating, tables, storage and shelving, filing, trash receptacles, clocks, framed artwork, artificial plants, and other accessories. Contract documentation is required to facilitate pricing, procurement and installation. The FF&E package is based on the furniture footprint developed in the Structural Interior Design (SID) portion of the interior design. Develop the FF&E package concurrently with the building design to ensure that there is coordination between the electrical outlets, switches, J-boxes, communication outlets and connections, and lighting as appropriate. In addition, coordinate layout with other building features such as architectural elements, thermostats, location of TV's, GF/GI equipment (for example computers, printers, copiers, shredders, faxes), etc. Locate furniture in front of windows only if the top of the item falls below the window and unless otherwise noted, do not attach furniture including furniture systems to the building. If project has SIPRNET and/or NIPRNET, coordinate furniture layout with SIPRNET and NIPRNET separation requirements. Verify that access required by DOIM for SIPRNET box and conduit is provided. The DOR shall interview appropriate Government personnel to determine FF&E requirements for furniture and furnishings prior to preparation of the scheme to be presented. Determine FFE items and quantities by, but not limited to: (1) the number of personnel to occupy the building, (2) job functions and related furniture/office equipment to support the job function, (3) room functions, (4) rank and grade. Present original sets of the scheme to reviewers at an interim design conference upon completion of the interim architectural submittal or three months prior to the submittal of the final FF&E package (whichever comes first).

Design may proceed to final with the FF&E scheme presented at the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers.

Provide six copies of the electronic versions of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide unbound, electronic drawings in CAD and BIM. Provide all files needed to v,/iew complete drawings. Submit all text documents in Microsoft Word or Excel..

Submit three copies of the final and complete FF&E information and samples in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first). Use more than one binder when there are numerous pages with thick samples. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out for upholstery and finish boards. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Furniture, Fixtures & Equipment" package and include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Provide electronic copies of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide six compact disks with all drawings files needed to view the complete drawings unbound and in the latest version AutoCAD. Provide six additional compact disks of all text documents in Microsoft Word or Excel.

Design submittal requirements include, but are not limited to:

1.1.1. Narrative of Interior Design Objectives

Provide a narrative description of the furniture, to include functional, safety and ergonomic considerations, durability, sustainability, aesthetics, and compatibility with the building design.

1.1.2. Furniture Order Form

Prepare one Furnishings Order Form for each item specified in the design. This form identifies all information required to order each individual item. In addition to the project name and location, project number, and submittal phase, the order form must include:

(a) Furniture item illustration and code

(b) Furniture item name

(c) Job name, location, and date

(d) General Services Administration (GSA) FSC Group, part, and section

(e) Manufacturer, Product name and Product model number or National Stock Number (NSN)

(f) Finish name and number (code to finish samples)

(g) Fabric name and number, minimum Wyzenbeek Abrasion Test double rubs (code to fabric samples)

(h) Dimensions

(i) Item location by room number and room name

(j) Quantity per room

(k) Total quantity

(l) Special instructions for procurement ordering and/or installation (if applicable)

(m) Written Product Description: include a non-proprietary paragraph listing the salient features of the item to include but not limited to:

(1) required features and characteristics

(2) ergonomic requirements

(3) functional requirements

(4) testing requirements

(5) furniture style

(6) construction materials

(7) minimum warranty

The following is an example for “m” features and characteristics, ergonomic requirements and functional requirements:

Chair Description:

(1) Mid-Back Ergonomic Task Chair

(2) Pneumatic Gaslift; Five Star Base

(3) Mesh Back; Upholstered Seat

(4) Height and Width Adjustable Task Arms:

a. Arm Height: 6”- 11” (+-1/2”)

b. Arm Width: 2”– 4” adjustment

(5) Height Adjustable Lumbar Support

(6) Adjustable Seat Height 16”-21” (+- 1”)

(7) Sliding Seat Depth Adjustment 15”-18” (+-1”)

(8) Standard Hard Casters (for carpeted areas)

(9) Overall Measurements:

a. Overall width: 25” - 27”

b. Overall depth: 25”– 28”

(10) Must have a minimum of the following adjustments (In addition to the above):

a. 360 Degree Swivel

b. Knee-Tilt with Tilt Tension

c. Back angle

d. Forward Tilt

e. Forward Tilt and Upright Tilt Lock

For projects with systems furniture, also provide a written description of the following minimum requirements:

(1) Type furniture systems (panel, stacking panels, spine wall, desk based system, or a combination)

(2) Minimum noise reduction coefficient (NRC)

(3) Minimum sound transfer coefficient (STC)

(4) Minimum flame spread and smoke development

(5) UL testing for task lighting and electrical system

(6) Panel widths and heights and their locations (this may be done on the drawings)Worksurface types and sizes (this may be done on the drawings)

(7) Worksurface edge type

(8) Varying panel/cover finish materials and locations (locations may be shown on the drawings)

(9) Storage requirements

(10) Keyboard requirements

(11) Lock and keying requirements

(12) Accessory components (examples: tack boards, marker boards, paper management)

(13) Electrical and communication raceway requirement; type, capacity and location (base, beltline, below and/or above beltline)

(14) Locations of communication cables (base, beltline, below and/or above beltline, top channel)

(15) Types of electrical outlets

(16) Types of communication jacks; provided and installed by others

(17) Locations of electrical outlets and communication jacks (this may be done on the drawings)

(18) Type of cable (examples: Cat. 5, Cat. 6, fiber optic; UTP or STP, etc.) system needs to support; provided and installed by others

1.1.3. Alternate Manufacturer List

Provide a table consisting of major furniture items that lists the manufacturers products specified on the Order Form and two alternate manufacturers. Major furniture items include, but are not limited to, casegoods, furniture systems, seating, and tables. Organize matrix by item code and item name. Supply alternates that are available on GSA Schedule and meet the requirements of the Furniture Order Form. One of the two alternates must be from UNICOR if possible. Provide manufacturer name address, telephone number, product series and product name for each alternate manufacturer.

1.1.4. FF&E Procurement List

Provide a table that lists all FF&E furniture, mission unique equipment and building Contractor Furnished/Contractor Installed (CF/CI) items. Give each item a code and name and designate whether item will be procured as part of the FF&E furniture, mission unique equipment or the building construction contract. Use the item code to key all FF&E documents including location plans, color boards, data sheets, cost estimate, etc.

1.1.5. Points of Contact (POCs)

Provide a comprehensive list of POCs needed to implement the FF&E package. This would include but not be limited to appropriate project team members, using activity contacts, interior design representatives, construction contractors and installers involved in the project. In addition to name, address, phone, fax and email, include each contact's job function. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

1.1.6. Color Boards

Provide color boards for all finishes and fabrics for all FF&E items. Finishes to be included but not limited to paint, laminate, wood finish, fabric, etc.

1.1.7. Itemized Furniture Cost Estimate

Provide an itemized cost estimate of furnishings keyed to the plans and specifications of products included in the package. This cost estimate should be based on GSA price schedules. The cost estimate must include separate line items for general contingency, installation, electrical hook-up for systems furniture or other furniture requiring hardwiring by a licensed electrician, freight charges and any other related costs. Installation and freight quotes from vendors should be use in lieu of a percentage allowance when available. Include a written statement that the pricing is based on GSA schedules. An estimate developed by a furniture dealership may be provided as support information for the estimate, but must be separate from the contractor provided estimate.

1.2. INTERIOR DESIGN DOCUMENTS

1.2.1. Overall Furniture and Area Plans

Provide floor Plans showing locations and quantities of all freestanding, and workstation furniture proposed for each floor of the building. Key each room to a large scale Furniture Placement Plan showing the furniture configuration, of all furniture. Provide enlarged area plans with a key plan identifying the area in which the building is located. Key all the items on the drawings by furniture item code. Do not provide manufacturer specific information such as product names and numbers on drawings, Drawings shall be non-proprietary. This is typical for FFE on all plans, including those mentioned below.

1.2.2. Workstation Plans

Show each typical workstation configuration in plan view, elevations or isometric view. Drawings shall illustrate panels and all major components for each typical workstation configuration. Identify workstations using the same numbering system as shown on the project drawings. Key components to a legend on each sheet which identifies and describes the components along with dimensions. Provide the plan, elevations and isometric of each typical workstation together on the same drawing sheet.

1.2.3. Panel Plans

Show panel locations and critical dimensions from finished face of walls, columns, panels including clearances and aisle widths. Key panel assemblies to a legend which shall include width, height, configuration of frames, panel fabric and finishes (if there are different selections existing within a project), powered or non-powered panel and wall mount locations.

1.2.4. Desk Plans

Provide typical free standing desk configurations in plan view, elevation or isometric view and identify components to clearly represent each desk configuration.

1.2.5. Reflected Ceiling Plans

Provide typical plans showing ceiling finishes and heights, lighting fixtures, heating ventilation and air conditioning supply and return, and sprinkler head placement for coordination of furniture.

1.2.6. Electrical and Telecommunication Plans

Show power provisions including type and locations of feeder components, activated outlets and other electrical componentsShow locations and quantities of outlets for workstations. Clearly identify different outlets, i.e. electrical, LAN and telecommunication receptacles indicating each type proposed. Show wiring configuration, (circuiting, switching, internal and external connections) and provide as applicable.

1.2.7. Artwork Placement Plans

Provide an Artwork Placement Plan to show location of artwork, assign an artwork item code to each piece of artwork. As an alternative, artwork can be located on the Furniture Plans. Provide a schedule that identifies each piece by room name and number. Provide installation instructions; include mounting height.

1.2.8. Window Drapery Plans

Provide Interior Window Drapery Plans. Key each drapery treatment to a schedule showing color, pattern, material, drapery size and type, draw direction, location and quantities.

1.3. FURNITURE SELECTION

1.3.1. Select furniture from the GSA Schedules. Specify furniture available open market when an item is not available on the GSA Schedules. Provide justification fort items not available on the GSA Schedules.

1.3.2. To the greatest extent possible when specifying furniture work within a manufacturer's family of furniture for selections, example: Steelcase, Turnstone, Brayton International, Metro, and Vecta are all Steelcase companies. Each alternate should also be specified from a manufacturer's family of furniture, example: first set of alternates would be specified from Knoll's family of furniture and the second from Herman Miller family of furniture. It may be necessary to make some selections from other than a manufacturer's family of furniture if costs are not reasonable for particular items, some items are not available or appropriate for the facility or the items are not on GSA Schedule. If this occurs, consider specifying product from an open line that is accessible by numerous dealerships. Select office furniture including case goods, tables, storage, seating, etc. that is compatible in style, finish and color. Select furniture that complies with ANSI/BIFMA and from manufacturer's standard product line as shown in the most recent published price list and/or amendment and not custom product.

1.4. CONSTRUCTION

1.4.1. Provide knee space at workstations and tables that is not obstructed by panels/legs that interfere with knee space of seated person and provide desks, storage and tables with leveling devices to compensate for uneven floors.

1.4.2. Provide worksurface tops constructed to prevent warpage. Provide user friendly features such as radius edges. Do not use sharp edges and exposed connections and ensure the underside of desks, tables and worksurfaces are completely and smoothly finished. Provide abutting worksurfaces that mate closely and are of equal heights when used in side-by-side configurations in order to provide a continuous and level worksurface.

1.4.3. Drawers shall stay securely closed when in the closed position and protect wires from damage during drawer operation. Include a safety catch to prevent accidental removal when fully open

1.4.4. Unless otherwise noted, specify lockable desks and workstations and storage of steel construction. Use tempered glass glazing when glazing is required.

1.5. FINISHES AND UPHOLSTERY

1.5.1. Specify neutral colors for casegoods, furniture systems, storage and tables. Specify desk worksurfaces and table tops that are not too light or too dark in color and have a pattern to help hide soiling. Accent colors are allowed in break and lounge areas. Keep placement of furniture systems panel fabric accent colors to a minimum. All finishes shall be cleanable with ordinary household cleaning solutions.

1.5.2. Use manufacturer's standard fabrics; including textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Customers Own Material

(COM) can be used in headquarter buildings in command suites with executive furniture. Coordinate specific locations with Corps of Engineers Interior Designer.

1.5.3. Specify seating upholstery that meets Wyzenbeek Abrasion Test, 55,000 minimum rubs. Specify a soil retardant finish for woven fabrics if Crypton or vinyl upholstery is not provided for seating in dining areas. Use manufacturer's standard fabrics. This includes textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Specify upholstery and finish colors and patterns that help hide soiling. Specify finishes that can be cleaned with ordinary household cleaning solutions.

1.6. ACCESSORIES

1.6.1. Specify all accessories required for completely finished furniture installation. Provide filing cabinets and storage for office supplies. Provide tack surfaces at workstations with overhead storage. Provide tackable surfaces at workstations with overhead storage.

1.6.2. Not Used.

1.6.3. Workstations are to be equipped with stable keyboard trays that have height adjustability, tilting capability, including negative tilt, have a mouse pad at same height as the keyboard tray that can accommodate both left and right handed users, and retractable under worksurface.

1.7. MISSION UNIQUE EQUIPMENT

Funding for FF&E furniture items and mission unique equipment (MUE) items are from two different sources. Separate the designs and procurement documentation for FFE items and MUE. MUE includes, but is not limited to, items such as industrial shelving, workbenches, appliances, fitness equipment, IT equipment and supporting carts. The User will purchase and install mission unique equipment items, unless otherwise noted. Identify locations of known MUE items such as industrial shelving, workbenches, appliances, etc. for space planning purposes.

1.8. SUSTAINABILITY

1.8.1. For all designs provided regardless of facility type, make every effort to implement all aspects of sustainability to the greatest extent possible for all the selections made in the FF&E package. This includes but is not limited to the selection of products that consider: **Material Chemistry and Safety of Inputs** (What chemicals are used in the construction of the selections?); **Recyclability** (Do the selections contain recycled content?); **Disassembly** (Can the selections be disassembled at the end of their useful life to recycle their materials?).

1.8.2. Make selections to the greatest extent possible of products that possess current McDonough Braungart Design Chemistry (MBDC) certification or other "third-party" certified Cradle to Cradle program, Forest Stewardship Council (FSC) certification, GREENGAURD certification or similar "third-party" certified products consisting of low-emitting materials.

1.9. FURNITURE SYSTEMS

1.9.1. General.

Where appropriate, design furniture systems in open office areas. Coordinate style and color of furniture systems with other storage, seating, etc. in open office areas. Minimize the number of workstation typicals and the parts and pieces required for the design to assist in future reconfiguration and inventorying.

1.9.2. Connector Systems.

Specify a connector system that allows removal of a single panel or spine wall within a typical workstation configuration without requiring disassembly of the workstation or removal of adjacent panels. Specify connector system with tight connections and continuous visual seals. When Acoustical panels are used, provide connector system with continuous acoustical seals. Specify concealed clips, screws, and other construction elements, where possible.

1.9.3. Panels and Spine Walls

Specify panels and spine walls with hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Panels shall be capable of structurally supporting more than 1 fully loaded component per panel per side. Raceways are to be an integral part of the panel and must be able to support lay-in cabling and have a large capacity for electrical and IT. Do not thread cables through the frame.

1.9.4. Electrical And Information/Technology (IT)

Design furniture with electrical systems that meets requirements of UL 1286 when powered panels are required and UL approved task lights that meet requirements of NFPA 70. Dependent on user requirements and Section 01 10 00, paragraph 3 requirements, it is recommended that workstation electrical and IT wiring entry come from the building walls to eliminate the use of power poles and access at the floor. Design electrical and IT systems that are easily accessed in the spine wall and panels without having to move return panels and components. Electrical and IT management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Specify connector system that has continuation of electrical and IT wiring within workstations and workstation to workstation.

1.9.5. Pedestals

Specify pedestals that are interchangeable from left to right, and right to left, and retain pedestal locking system capability.

1.10. EXECUTIVE FURNITURE

1.10.1. Design for executive furniture in command areas, coordinate specific locations with Corps of Engineers Interior Designer. Use upgraded furniture, upholsteries and finishes in command suites. This includes but is not limited to wood casegoods, seating and tables. Select executive furniture casegoods from a single manufacturer and style line, to include workstations, credenzas, filing, and storage, etc.

1.10.2. Specify furniture with wood veneer finish (except worksurfaces) with mitered solid wood edge of same wood type. Provide worksurface plastic laminate that closely matches adjacent wood veneer. Other executive office furniture such as seating, tables, executive conference room furniture, etc. shall be compatible in style, finish and color with executive furniture casegoods.

1.11. SEATING

1.11.1. General

Specify appropriate chair casters and glides for the floor finish where the seating is located. Universal casters that are appropriate for both hard surface flooring and carpet are preferred. All seating shall support up to a minimum of 250 lbs.

1.11.2. Desk and Guest Seating

Select ergonomic desk chairs with casters, non-upholstered adjustable arms, waterfall front, swivel, tilt, variable back lock, adjustable back height or adjustable lumbar support, pneumatic seat height adjustment, and padded, contoured upholstered seat and back. Desk and guest chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Depending on scale of desk chair provide seat pan forward and back adjustment to increase or decrease depth of seat pan. All desk chairs shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Select guest chairs that are compatible in style, finish and color with the desk chairs.

1.11.3. Conference Room Seating

At tables, select ergonomic conference seating with casters, non-upholstered arms, waterfall front, swivel, tilt, pneumatic seat height adjustment, and padded, contoured seat and back, unless otherwise noted. Select arm height and/or design that allows seating to be moved up closely to the table top. Conference chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Perimeter conference chairs shall be compatible in style, finish and color with conference seating at the tables.

1.11.4. Lounge, Waiting and Reception Area Seating

Select seating with arms and cushioned, upholstered seat and back. In heavy use areas, arms shall be easily cleaned such as non-upholstered arms or upholstered arms with wood arm caps unless otherwise noted.

1.11.5. Break Room Seating

Select stackable seating that is easily cleaned. Seating shall be appropriate for table and counter heights as applicable with non-upholstered arms if arms are required. Chairs shall have metal legs and composite materials for seats.

1.11.6. Lounge, Waiting and Reception Furniture.

Design for end and coffee tables with plastic laminate tops that are compatible in style finish and color with the seating.

1.12. FILING AND STORAGE.

Select storage and shelving units that meet customer’s functional load requirements for stored items. Specify counterweights for filing cabinets when required by the manufacturer for stability. File drawers shall allow only one drawer to be opened at a time. Provide heavy duty storage and shelving if information is not available.

1.13. TRAINING TABLES.

Don’t use plastic laminate self edge. Training tables shall be reconfigurable, moveable and storable; lighter weight folding with dollies or castered as necessary. Specify dollies if required.

1.14. FURNITURE WARRANTIES.

Specify manufacturer's performance guarantees or warranties that include parts, labor and transportation as follows:

Furniture System, unless otherwise noted – 10 year minimum
Furniture System Task Lights – 2 year minimum, excluding bulbs
Furniture System Fabric – 3 year minimum
Desks - 10 year minimum
Seating, unless otherwise noted - 10 year minimum
Seating Mechanisms and Pneumatic Cylinders - 10 years
Fabric - 3 years minimum
Filing and Storage - 10 year minimum
Tables, unless otherwise noted - 10 year minimum
Table Mechanisms – 5 year
Table Ganging Device - 1 year
Items not listed above - 1 year minimum

ATTACHMENT C
TRACKING COMMENTS IN DRCHECKS

1.0 General

The Government and DB Contractor shall set up the project in Dr Checks. Throughout the design process, the parties shall enter, track, and back-check comments using the DrChecks system. Government reviewers enter design review comments into DrChecks. Designers of Record shall annotate comments timely and specifically to indicate exactly what action will be taken or why the action is not required. Comments considered critical by the conference participants shall be flagged as such.

2.0 DrChecks Review Comments

The Contractor and the Government shall monitor DrChecks to assure all comments are annotated and agreed to by the designers and reviewers prior to the next submittal. The DrChecks comments and responses shall be printed and included in the design analysis for record.

2.1. Conference participants (reviewers) will expect coordination between Design Analysis calculations and the submitted design. Reviewers will also focus on the design submittal's satisfaction of the contract requirements.

2.2. The Designers of Record shall answer each comment in DrChecks with a formal response prior to the next submittal, clearly indicating what action will be taken and what drawing/spec will change. Designers of Record are encouraged to directly contact reviewers to discuss and agree to the formal comment responses rather than relying only on DrChecks and review meetings to discuss comments. With the next design conference, reviewers will back-check answers to the comments against the submittal, in addition to reviewing additional design work.

2.3. Comments that, in the DB Contractor's opinion, require effort outside the scope of the contract shall be clearly indicated as such in DrChecks. The DB Contractor shall not proceed with work outside the contract until a modification to the contract is properly executed, if one is necessary.

3.0 DrChecks Initial Account Set-Up

To initialize an office's use of DrChecks, choose a contact person within the office to call the DrChecks Help Desk at 800-428-HELP, M-F, 8AM-5PM, Central time. This POC will be given an office password to distribute to others in the office. Individuals can then go to the hyperlink at http://www.projnet.org and register as a first time user. Upon registration, each user will be given a personal password to the DrChecks system.

3.1. Once the office and individuals are registered, the COE's project manager or lead reviewer will assign the individuals and/or offices to the specific project for review. At this point, persons assigned can make comments, annotate comments, and close comments, depending on their particular assignment.

4.0 DrChecks Reviewer Role

The Contractor is the technical reviewer and the Government is the compliance reviewer of the DB designers design documents. Each reviewer enters their own comments into the Dr Checks system. To enter comments:

4.1. Log into DrChecks.

4.2. Click on the appropriate project.

4.3. Click on the appropriate review conference. An Add comment screen will appear.

4.4. Select or fill out the appropriate sections (particularly comment discipline and type of document for sorting) of the comment form and enter the comment in the space provided.

4.5. Click the Add Comment button. The comment will be added to the database and a fresh screen will appear for the next comment you have.

4.6. Once comments are all entered, exit DrChecks by choosing “My Account” and then Logout.

5.0 DrChecks Comment Evaluation

The role of the designers of record is to evaluate and respond to the comments entered by the Government reviewers and by the DB Contractor. To respond to comments:

5.1. Log into DrChecks.

5.2. Click on the appropriate project.

5.3. Under “Evaluate” click on the number under “Pending”.

5.4. Locate the comments that require your evaluation. (Note: If you know the comment number you can use the Quick Pick window on your home page in DrChecks; enter the number and click on go.)

5.5. Select the appropriate evaluation (concur, non-concur, for information only, or check and resolve) and add the response.

5.6. Click on the Add button. The evaluation will be added to the database and a fresh screen will appear with the next comment.

5.7. Once evaluations are all entered, exit DrChecks by choosing “My Account” and then Logout.

6.0 DrChecks Back-check

At the following design conference, participants will back-check comment annotations against newly presented documents to verify that the designers' responses are acceptable and completed. The Contractor and Government reviewers shall either enter additional back-check comments, as necessary or close those that are resolved as a result of the design conferences:

6.1. Log into DrChecks.

6.2. Click on the appropriate project.

6.3. Under “My Backcheck” click on the number under “Pending”.

6.4. If you agree with the designer’s response select “Close Comment” and add a closing response if desired.

6.5. If you do not agree with the designer’s response or the submittal does not reflect the response given, select “Issue Open”, enter additional information.

6.6. Click on the Add button. The back-check will be added to the database and a fresh screen will appear with the next comment.

6.7. Once back-checks are all entered, exit DrChecks by choosing “My Account” and then Logout. The design is completed and final when there are no pending comments to be evaluated and there are no pending or open comments under back-check.

ATTACHMENT D
SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

Instructions: Use the information outlined in this document to provide the minimum requirement for development of Fire Protection and Life Safety Code submittals for all building projects. Additional and supplemental information may be used to further develop the code review. Insert N/A after criteria, which may be “not applicable”.

1.0 SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW

1.1. Project Name (insert name and location)

1.2. Applicable Codes and Standards

1.2.1. Unified Facilities Criteria (UFC): 3-600-01, Design: Fire Protection Engineering For Facilities

1.2.2. International Building Code (IBC) for fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements, except as modified by UFC 3-600-01.

1.2.3. National Fire Protection Association (NFPA) 101 Life Safety Code (latest edition), for building egress and life safety and applicable criteria in UFC 3-600-01.

1.2.4. ADA and ABA Accessiblity Guidelines. For Buildings and Facilities See Section 01 10 00, Paragraph 3 for facility specific criteria.

1.3. Occupancy Classification
IBC chapters 3 and 4

1.4. Construction Type
IBC chapter 6

1.5. Area Limitations
IBC chapter 5, table 503

1.6. Allowable Floor Areas
IBC section 503, 505

1.7. Allowable area increases
IBC section 506, 507

1.8. Maximum Height of Buildings
IBC section 504

1.9. Fire-resistive substitution

1.10. Occupancy Separations
IBC table 302.3.2

1.11. Fire Resistive Requirements

1.11.1. Exterior Walls - [_____] hour rating, IBC table 601, 602

1.11.2. Interior Bearing walls - [_____] hour rating

1.11.3. Structural frame - [_____] hour rating

1.11.4. Permanent partitions - [_____] hour rating

1.11.5. Shaft enclosures - [_____] hour rating

1.11.6. Floors & Floor-Ceilings - [_____] hour rating

1.11.7. Roofs and Roof Ceilings - [_____] hour rating

1.12. Automatic Sprinklers and others used to determine the need for automatic Extinguishing Equipment, Extinguishing Systems, Foam Systems, Standpipe

1.12.1. UFC 3-600-01, chapters 4 and 6 systems, wet chemical systems, etc. State which systems are required and to what criteria they will be designed.

1.12.2. UFC 3-600-01, Appendix B Occupancy Classification. Note the classification for each room. This may be accomplished by classifying the entire building and noting exceptions for rooms that differ (E.g. The entire building is Light Hazard except boiler room and storage rooms which are [_____], etc.)

1.12.3. UFC 3-600-01, Chapter 3 Sprinkler Design Density, Sprinkler Design Area, Water Demand for Hose Streams (supply pressure and source requirements).

1.12.4. UFC 3-600-01, Chapter 4 Coverage per sprinkler head. Extended coverage sprinkler heads are not permitted.

1.12.5. Available Water Supply. Provide the results of the water flow tests showing the available water supply static pressure and residual pressure at flow. Based on this data and the estimated flow and pressure required for the sprinkler system, determine the need for a fire pump.

1.12.6. NFPA 13, Para. 8.16.4.6.1. Provide backflow preventer valves as required by the local municipality, authority, or water purveyor. Provide a test valve located downstream of the backflow preventer for flow testing the backflow preventer at full system demand flow. Route the discharge to an appropriate location outside the building.

1.13. Kitchen Cooking Exhaust Equipment

Describe when kitchen cooking exhaust equipment is provided for the project. Type of extinguishing systems for the equipment should be provided. per NFPA 96. Show all interlocks with manual release switches, fuel shutoff valves, electrical shunt trips, exhaust fans, and building alarms.

1.14. Portable Fire Extinguishers, fire classification and travel distance. per NFPA 10

1.15. Enclosure Protection and Penetration Requirements. - Opening Protectives and Through Penetrations

1.15.1. IBC Section712, 715 and Table 715.3. Mechanical rooms, exit stairways, storage rooms, janitor [_____] hour rating. IBC Table 302.1.1

1.15.2. Fire Blocks, Draft Stops, Through Penetrations and Opening Protectives

1.16. Fire Dampers. Describe where fire dampers and smoke dampers are to be used (IBC Section 716 and NFPA 90A}. State whether isolation smoke dampers are required at the air handler.

1.17. Detection Alarm and Communication. UFC 3-600-01, (Chapter 5); NFPA 101 para. 3.4 (chapters 12-42); NFPA 72

1.18. Mass Notification. Describe building/facility mass notification system (UFC 4-021-01) type and type of base-wide mass notification/communication system. State whether the visible notification appliances will be combined with the fire alarm system or kept separate. (Note: Navy has taken position to combine visible notification appliances with fire alarm).

1.19. Interior Finishes (classification). NFPA 101.10.2.3 and NFPA 101.7.1.4

1.20. Means of Egress

1.20.1. Separation of Means of Egress, NFPA 101 chapters 7 and 12-42; NFPA101.7.1.3

1.20.2. Occupant Load, NFPA101.7.3.1 and chapters 12-42.

1.20.3. Egress Capacity (stairs, corridors, ramps and doors) NFPA101.7.3.3

1.20.4. Number of Means of Egress, NFPA101.7.4 and chapters 12-42.

1.20.5. Dead end limits and Common Path of Travel, NFPA 101.7.5.1.6 and chapters 12-42.

1.20.6. Accessible Means of Egress (for accessible buildings), NFPA101.7.5.4

1.20.7. Measurement of Travel Distance to Exits, NFPA101.7.6 and chapters 12-42.

1.20.8. Discharge from Exits, NFPA101.7.7.2

1.20.9. Illumination of Means of Egress, NFPA101.7.8

1.20.10. Emergency Lighting, NFPA101.7.9

1.20.11. Marking of Means of Egress, NFPA101.7.10

1.21. Elevators, UFC 3-600-01, Chapter 6; IBC and ASME A17.1 - 2000,(Safety Code for Elevators and Escalators)

1.22. Accessibility Requirements, ADA and ABA Accessibility Guidelines for Buildings and Facilities

1.23. Certification of Fire Protection and Life Safety Code Requirements. (Note: Edit the Fire team membership if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features for this project in accordance with the attached completed form(s).

1.24. Designer of Record. Certification of Fire protection and Life Safety Code Requirements. (Note: Edit the Fire team members if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features of this project.

Fire Protection Engineer of Record:

_____

Signature and Stamp

Date

OR

Architect of Record:

_____

Signature and Stamp

Date

Mechanical Engineer of Record:

_____

Signature and Stamp

Date

Electrical Engineer of Record:

_____

Signature/Date

ATTACHMENT E
LEED SUBMITTALS

LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	**LEED-NC v3 Submittals (OCT09)**		Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
GENERAL							
	GENERAL - All calculations shall be in accordance with LEED 2009 Reference Guide.						
	GENERAL: Obtain excel version of this spreadsheet at http://en.sas.usace.army.mil/enWeb, "Engineering Criteria".						
	GENERAL - For all credits, narrative/comments may be added to describe special circumstances or considerations regarding the project's credit approach.						
	GENERAL - Include all required LEED drawings indicated below in contract drawings with applicable discipline drawings, labeled For Reference Only.						
	NOTE: Each submittal indicated with "**" differs from LEED certified project submittals by either having a different due date or being an added submittal not required by GBCI.						
	NOTE: Projects seeking LEED certification need only submit to GBCI whatever documentation is acceptable to GBCI (for example, licensed professional certifications). This checklist identifies what must be submitted to the Government for internal review purposes. Government review of LEED documentation in no way supercedes or modifies the requirements and rulings of of GBCI for purposes of compliance with project requirement to obtain LEED certifiaction.						
	GENERAL - Audit documentation may include but is not limited to what is indicated in this table.						
			Closeout		List of all Final Design submittals revised after final design to reflect actual closeout conditions. Revised Final Design submittals. - OR - Statement confirming that no changes have been made since final design that effect final design submittal documents.		Proj Engr (PE)
CATEGORY 1 - SUSTAINABLE SITES							
SSPR1		Construction Activity Pollution Prevention (PREREQUISITE)	**Final Design		List of drawings and specifications that address the erosion control, particulate/dust control and sedimentation control measures to be implemented.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design		Narrative that indicates which compliance path was used (NPDES or Local standards) and describes the measures to be implemented on the project. If a local standard was followed, provide specific information to demonstrate that the local standard is equal to or more stringent than the NPDES program.		CIV
SS1		Site Selection	Final Design		Statement confirming that project does not meet any of the prohibited criteria.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	X	LEED Site plan drawing that shows all proposed development, line depicting boundary of all bodies of water and/or wetlands within 100 feet of project boundary and a line depicting 5' elevation above 100 year flood line that falls within project boundary. Not required if neither condition applies.		CIV
SS2		Development Density & Community Connectivity	Final Design		Option 1: LEED Site vicinity plan showing project site and surrounding development. Show density boundary or note drawing scale.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Table indicating, for project site and all surrounding sites within density radius (keyed to site vicinity plan), site area and building area. Project development density calculation. Density radius calculation. Development density calculation within density radius.		CIV
			Final Design		Option 2: LEED Site vicinity plan showing project site, the 1/2 mile community radius, pedestrian walkways and the locations of the residential development(s) and Basic Services surrounding the project site.		CIV
			Final Design		Option 2: List (including business name and type) of all Basic Services facilities within the 1/2 mile radius, keyed to site vicinity plan.		CIV
SS3		Brownfield Redevelopment	Final Design		Narrative describing contamination and the remediation activities included in project. Include statement indicating how site was determined to be a brownfield.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS4.1		Alternative Transportation: Public Transportation Access	Final Design		Statement indicating which option for compliance applies. State whether public transportation is existing or proposed and, if proposed, cite source of this information.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: LEED Site vicinity plan showing project site, mass transit stops and pedestrian path to them with path distance noted.		CIV
			Final Design		Option 2: LEED Site vicinity plan showing project site, bus stops and pedestrian path to them with path distance noted.		CIV
SS4.2		Alternative Transportation: Bicycle Storage & Changing Rooms	Final Design		FTE calculation. Bicycle storage spaces calculation. Shower/changing facilities calculation.		CIV
			Final Design		List of drawings that show the location(s) of bicycle storage areas. Statement indicating distance from building entrance.		CIV
			Final Design		List of drawings that show the location(s) of shower/changing facilities and, if located outside the buiding, statement indicating distance from building entrance.		ARC

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SS4.3		Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	Final Design		Statement indicating which option for compliance applies. FTE calculation. Statement indicating total parking capacity of site.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Low-emission & fuel-efficient vehicle calculation.		CIV
			Final Design		Option 1: List of drawings and specification references that show location and number of preferred parking spaces for low-emission & fuel-efficient vehicles and signage.		CIV
			Final Design		Option 1: Statement indicating quantity, make, model and manufacturer of low-emission & fuel-efficient vehicles to be provided. Statement confirming vehicles are zero-emission or indicating ACEEE vehicle scores.		CIV
			Final Design		Option 2: Low-emission & fuel-efficient vehicle parking calculation.		CIV
			Final Design		Option 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Low-emission & fuel-efficient vehicle refueling station calculation.		CIV
			Final Design		Option 3: List of drawings and specifications indicating location and number of refueling stations, fuel type and fueling capacity for each station for an 8-hour period.		CIV
			Closeout	X	Option 3: Construction product submittals indicating what was provided and confirming compliance with respect to fuel type and fueling capacity for each station for an 8-hour period.		CIV
SS4.4		Alternative Transportation: Parking Capacity	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Preferred parking calculation including number of spaces required, total provided, preferred spaces provided and percentage.		CIV
			Final Design		Option 2: FTE calculation. Preferred parking calculation including number of spaces provided, preferred spaces provided and percentage.		CIV
			Final Design		Options 1 and 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design		Option 3: Narrative indicating number of spaces required and provided and describing infrastructure and support programs with description of project features to support them.		CIV
SS5.1		Site Development: Protect or Restore Habitat	**Final Design		Option 1: List of drawing and specification references that convey site disturbance limits.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design		Option 2: LEED site plan drawing that delineates boundaries of each preserved and restored habitat area with area (sf) noted for each.		CIV
			**Final Design		Option 2: Percentage calculation of restored/preserved habitat to total site area. List of drawings and specification references that convey restoration planting requirements.		CIV
SS5.2		Site Development: Maximize Open Space	Final Design		Option 2: LEED site plan drawing delineating boundary of vegetated open space adjacent to building with areas of building footprint and designated open space noted.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS6.1		Stormwater Design: Quantity Control	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Option 1: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf) -OR - Narrative describing site conditions, measures and controls to be implemented to prevent excessive stream velocities and erosion.		CIV
			Final Design		Option 2: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf). Indicate percent reduction in each.		CIV
SS6.2		Stormwater Design: Quality Control	Final Design		For non-structural controls, list all BMPs used and, for each, describe the function of the BMP and indicate the percent annual rainfall treated. List all structural controls and, for each, describe the pollutant removal and indicate the percent annual rainfall treated.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS7.1		Heat Island Effect: Non-Roof	**Final Design		LEED site plan drawing indicating locations and quantities of each paving type, including areas of shaded pavement. Percentage calculation indicating percentage of reflective/shaded/open grid area.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV

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SS7.2		Heat Island Effect: Roof	Final Design		Option 1: Percentage calculation indicating percentage of SRI compliant roof area. List of drawings and specification references that convey SRI requirements and roof slopes.		ARC
			Final Design		Option 1: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout		Option 1: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X	Option 1: Manufacturer published product data or certification confirming SRI		PE
			Final Design		Option 2: Percentage calculation indicating percentage of vegetated roof area.		ARC
			Final Design		Option 3: Combined reflective and green roof calculation.		ARC
			Final Design		Option 3: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout		Option 3: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X	Option 3: Manufacturer published product data or certification confirming SRI		PE
SS8		Light Pollution Reduction	Final Design		Interior Lighting: List of drawings and specification references that convey interior lighting requirements (location and type of all installed interior lighting, location of non-opaque exterior envelope surfaces, allowing confirmation that maximum candela value from interiorfixtures does not intersect non-opaque building envelope surfaces). - OR - List of drawings and specification references that show automatic lighting controls compliance with credit requirement.		ELEC
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		ELEC
			Final Design		Exterior Lighting: List of drawings and specification references that convey exterior lighting requirements (location and type of all site lighting and building façade/landscape lighting).		ELEC
			Final Design		Exterior Site Lighting Power Density (LPD): Tabulation for exterior site lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all site lighting.		ELEC
			Final Design		Exterior Building Facade/Landscape Lighting Power Density (LPD): Tabulation for exterior building facade/landscape lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all building facade/landscape lighting.		ELEC
			Final Design		Exterior Lighting IESNA Zone: Indicate which IESNA zone is applicable to the project.		ELEC
			Final Design		Exterior Lighting Site Lumen table indicating, for each fixture type, quantity installed, initial lamp lumens per luminaire, initial lamp lumens above 90 degrees from Nadir, total lamp lumens and total lamp lumens above 90 degrees. Percentage of site lamp lumens above 90 degrees from nadir to total lamp lumens.		ELEC
			Final Design		Exterior Lighting Narrative describing analysis used for addressing requirements for light trespass at site boundary and beyond.		ELEC
CATEGORY 2 – WATER EFFICIENCY							
WEPR1		Water Use Reduction: 20% Reduction	Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design		Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC

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			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design		Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Closeout	X	Manufacturer published product data or certification confirming fixture water usage.		PE
WE1.1		Water Efficient Landscaping: Reduce by 50%	Final Design		Statement indicating which option for compliance applies.		CIV
			**Final Design		Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design		Calculation indicating, for baseline and design case, total water applied, total potable water applied, total non-potable water applied. Design case percent potable water reduction. If nonpotable water is used, indicate source of nonpotable water.		CIV
			Final Design		List of landscape plan drawings.		CIV
			Final Design		Narrative describing landscaping and irrigation design strategies, including water use calculation methodology used to determine savings and, if non-potable water is used, specific information about source and available quantity.		CIV
WE1.2		Water Efficient Landscaping: No Potable Water Use or No Irrigation	Same as WE1.1		Same as WE1.1		CIV
WE2		Innovative Wastewater Technologies	Final Design		Statement confirming which option for compliance applies.		MEC
			Final Design		Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design		Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design		Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC
			Final Design		Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design		Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Final Design		Option 1: If onsite non-potable water is used, identify source(s), indicate annual quantity from each source and indicate total annual quantity from all onsite non-potable water sources.		MEC
			Final Design		Option 1: Summary calculation indicating baseline annual water consumption, design case annual water consumption, non-potable annual water consumption and total percentage annual water savings.		MEC
			Final Design		Option 2: Statement confirming on-site treatment of all generated wastewater to tertiary standards and all treated wastewater is either infiltrated or used on-site.		MEC
			Final Design		Option 2: List of drawing and specification references that convey design of on-site wastewater treatment features.		CIV
			Final Design		Option 2: On-site water treatment quantity calculation indicating all on-site wastewater source(s), annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from each source and totals for annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from all sources.		CIV
			Final Design		Option 2: Wastewater summary calculation indicating design case annual flush fixture water usage, annual on-site water treatment and percentage sewage convyance reduction.		MEC
			Final Design		Narrative describing project strategy for reduction of potable water use for sewage conveyance, including specific information on reclaimed water usage and treated wastewater usage.		MEC
WE3		Water Use Reduction: 30% - 40% Reduction	Same as WEPR1		Same as WEPR1		MEC
CATEGORY 3 – ENERGY AND ATMOSPHERE							

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EAPR1		Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	**Final Design		**Owner's Project Requirements document		ALL
			**Final Design		**Basis of Design document for commissioned systems		MEC, ELEC
			**Final Design		**Commissioning Plan		MEC, ELEC
			Closeout		Statement confirming all commissioning requirements have been incorporated into construction documents.		PE
			Closeout		Commissioning Report		PE
EAPR2		Minimum Energy Performance (PREREQUISITE)	Final Design		Statement listing the mandatory provisions of ASHRAE 90.1 that project meets relative to compliance with this prerequisite and indicating which compliance path was used.		MEC ELEC ARC
			Final Design		Statement indicating which compliance path option applies.		MEC
			Final Design		Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design		Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design		Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design		Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design		Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design		Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features		MEC
			Final Design		Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)		MEC
EAPR3		Fundamental Refrigerant Management (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies.		MEC
			Final Design		Option 2: Narrative describing phase out plan, including specific information on phase out dates and refrigerant quantities.		MEC
EA1		Optimize Energy Performance	Final Design		Statement indicating which compliance path option applies.		MEC
			Final Design		Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design		Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design		Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design		Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design		Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design		Option 1: Energy type summary lising, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design		Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design		Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design		Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design		Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design		Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design		Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design		Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features		MEC
			Final Design		Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)		MEC
EA2.1		On-Site Renewable Energy	Final Design		Statement indicating which compliance path option applies.		ELEC
			Final Design		List all on-site renewable energy sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost. Indicate total annual energy use (all sources), total annual energy cost (all sources) and percent renewable energy cost.		ELEC MEC
			Final Design		Option 1: Indicate, for renewable energy,proposed design total annual energy generated and annual cost.		ELEC MEC
			Final Design		Option 2: Indicate CBECS building type and building gross area. Provide the following CBECS data: median annual electrical intensity, median annual non-electrical fuel intensity, average electric energy cost, average non-electric fuel cost, annual electric energy use and cost, annual non-electric fuel use and cost.		ELEC MEC
			Final Design		Option 2: Narrative describing renewable systems and explaining calculation method used to estimate annual energy generated, including factors influencing performance.		ELEC MEC
EA2.2		On-Site Renewable Energy	Same as EA2.1		Same as EA2.1		ELEC MEC
EA2.3		On-Site Renewable Energy	Same as EA2.1		Same as EA2.1		ELEC MEC
EA3		Enhanced Commissioning	**Final Design		**Owner's Project Requirements document (OPR)		ALL
			**Final Design		**Basis of Design document for commissioned systems (BOD)		ELEC MEC
			**Final Design		**Commissioning Plan		ELEC MEC
			Closeout		Statement confirming all commissioning requirements have been incorporated into construction documents.		PE
			Closeout		**Commissioning Report		PE
			**Final Design		Statement by CxA confirming Commissioning Design Review		
			Closeout		Statement by CxA confirming review of Contractor submittals for compliance with OPR and BOD		PE
			Closeout		**Systems Manual		PE
			Closeout		Statement by CxA confirming completion of O&M staff and occupant training		PE
			Closeout		**Scope of work for post-occupancy review of building operation, including plan for resolution of outstanding issues		PE
			**Predesign		Statement confirming CxA qualifications and contractual relationships relative to work on this project, demonstrating that CxA is an independent third party.		MEC
EA4		Enhanced Refrigerant Management	Final Design		Refrigerant impact calculation table with all building data and calculation values as shown in LEED 2009 Reference Guide Example Calculations		MEC
			Final Design		Narrative describing any special circumstances or explanatory remarks		
			Closeout	X	Cut sheets highlighting refrigerant data for all HVAC components.		PE
EA5		Measurement & Verification	Closeout		Statement indicating which compliance path option applies.		PE
			Closeout		Measurement and Verification Plan including Corrective Action Plan		PE
			Closeout		**Scope of work for post-occupancy implementation of M&V plan including corrective action plan.		PE
EA6		Green Power	Closeout		Statement indicating which compliance path option applies.		PE
			Closeout		Option 1: Indicate proposed design total annual electric energy usage		PE
			Closeout		Option 2: Indicate actual total annual electric energy usage		PE
			Closeout		Option 3: Calculation indicating building type, total gross area, median electrical intensity and annual electric energy use		PE

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Closeout		Green power provider summary table indicating, for each purchase type, provider name, annual quantity green power purchased and contract term. Indicate total annual green power use and indicate percent green power		PE
			Closeout		Narrative describing how Green Power or Green Tags are purchased		PE
CATEGORY 4 – MATERIALS AND RESOURCES							
MRPR1		Storage & Collection of Recyclables (PREREQUISITE)	Final Design		Statement confirming that recycling area will accommodate recycling of plastic, metal, paper, cardboard and glass. Narrative indicating any other materials addressed and coordination with pickup.		ARC
MR1.1		Building Reuse: Maintain 55% of Existing Walls, Floors & Roof	**Final Design		If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design		Spreadsheet listing, for each building structural/envelope element, the existing area and reused area. Total percent reused.		ARC
MR1.2		Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1		ARC
MR1.3		Building Reuse: Maintain 95% of Existing Walls, Floors & Roof	Same as MR1.1		Same as MR1.1		ARC
MR1.4		Building Reuse: Maintain 50% of Interior Non-Structural Elements	**Final Design		If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design		Spreadsheet listing, for each building interior non-structural element, the existing area and reused area. Total percent reused.		ARC
MR2.1		Construction Waste Management: Divert 50% From Disposal	**Preconstruction		Waste Management Plan		PE
			**Construction Quarterly and Closeout		Spreadsheet calculations indicating material description, disposal/diversion location (or recycling hauler), weight, total waste generated, total waste diverted, diversion percentage		PE
			**Construction Quarterly and Closeout		Receipts/tickets for all items on spreadsheet		PE
MR2.2		Construction Waste Management: Divert 75% From Disposal	Same as MR2.1		Same as MR2.1		PE
MR3.1		Materials Reuse: 5%	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each reused/salvaged material, material description, source or vendor, cost. Total reused/salvaged materials percentage.		PE
MR3.2		Materials Reuse: 10%	Same as MR3.1		Same as MR3.1		PE
MR4.1		Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each recycled content material, material name/description, manufacturer, cost, post-consumer recycled content percent, pre-consumer recycled content percent, source of recycled content data. Total post-consumer content materials cost, total pre-consumer content materials cost, total combined recycled content materials cost, recycled content materials percentage.		PE
			Final Design or NLT Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Manufacturer published product data or certification, confirming recycled content percentages in spreadsheet		PE
MR4.2		Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Same as MR4.1		Same as MR4.1		PE
MR5.1		Regional Materials:10% Extracted, Processed & Manufactured Regionally	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each regional material, material name/description, manufacturer, cost, percent compliant, harvest distance, manufacture distance, source of manufacture and harvest location data. Total regional materials cost, regional materials percentage.		PE
			Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Manufacturer published product data or certification confirming regional material percentages in spreadsheet		PE

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MR5.2		Regional Materials:20% Extracted, Processed & Manufactured Regionally	Same as MR5.1		Same as MR5.1		PE
MR6		Rapidly Renewable Materials	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each rapidly renewable material, material name/description, manufacturer, cost, rapidly renewable content percent, rapidly renewable product value. Total rapidly renewable product value, rapidly renewable materials percentage.		PE
			Final Design		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		ARC
			Closeout	X	Manufacturer published product data or certification confirming rapidly renewable material percentages in spreadsheet		PE
MR7		Certified Wood	Closeout		Statement indicating total materials value and whether default or actual.		PE
			Closeout		Spreadsheet calculations indicating, for each certified wood material, material name/description, vendor, cost, wood component percent, certified wood percent of wood component, FSC chain of custody certificate number. Total certified wood product value, certified wood materials percentage.		PE
			Final Design or NLT Preconstruction		**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	X	Vendor invoices, FSC chain of custody certificates and anufacturer published product data or certification confirming all certified wood materials percentages in spreadsheet.		PE
INDOOR ENVIRONMENTAL QUALITY							
EQPR1		Minimum IAQ Performance (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about fresh air intake volumes and special considerations.		MEC
EQPR2		Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Final Design		Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.		ARC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements (signage, exhaust system, room separation details, etc).		ARC
EQ1		Outdoor Air Delivery Monitoring	Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design and CO2 monitoring system, including specifics about monitors, operational parameters and setpoints.		MEC
			Closeout	X	Cut sheets for CO2 monitoring system.		PE
EQ2		Increased Ventilation	Final Design		Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.		MEC
			Final Design		Narrative describing the project's ventilation design, including specifics about zone fresh air intake volumes and demonstrating compliance.		MEC
			Final Design		Option 2: Narrative describing design method used for determining natural ventilation design, including calculation methodology/model results and demonstrating compliance.		MEC
			Final Design		List of drawing and specification references that convey conformance to applicable requirements.		MEC
EQ3.1		Construction IAQ Management Plan: During Construction	**Preconstruction		Construction IAQ Management Plan		PE
			Closeout		Statement confirming whether air handling units were operated during construction		PE
			Closeout		Dated jobsite photos showing examples of IAQ management plan practices being implemented. Label photos to indicate which practice they demonstrate. Minimum one photo of each practice at each building.		PE

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Closeout		Spreadsheet indicating, for each filter installed during construction, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy.		PE
EQ3.2		Construction IAQ Management Plan: Before Occupancy	**Preconstruction		Construction IAQ Management Plan		PE
			Closeout		Statement indicating which option for compliance applies and confirming that required activities have occurred that meet the applicable requirements.		PE
			Closeout		Option 1a: Narrative describing the project's flushout process, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout		Option 1b: Narrative describing the project's pre-occupancy and post-occupancy flushout processes, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout		Option 2: Narrative describing the project's IAQ testing process, including specifics about contaminants tested for, locations, remaining work at time of test, retest parameters and special considerations (if any).		PE
			Closeout		Option 2: IAQ testing report demonstrating compliance.		PE
EQ4.1		Low Emitting Materials: Adhesives & Sealants	Closeout		Spreadsheet indicating, for each applicable indoor adhesive, sealant and sealant primer used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout		Spreadsheet indicating, for each applicable indoor aerosol adhesive, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor aerosol adhesives were used for the project.		PE
			Closeout	X	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.2		Low Emitting Materials: Paints & Coatings	Closeout		Spreadsheet indicating, for each applicable indoor paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout		Spreadsheet indicating, for each applicable indoor anti-corrosive/anti-rust paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor anti-corrosive/anti-rust paints were used for the project .		PE
			Closeout	X	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.3		Low Emitting Materials: Flooring Systems	Closeout		Spreadsheet indicating, for each indoor flooring system used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data.		PE
			Closeout		Spreadsheet indicating, for each indoor carpet cushion used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data - OR - Statement confirming no indoor carpet cushion was used for the project.		PE
			Closeout	X	Manufacturer published product data or certification confirming material compliance label in spreadsheet		PE
EQ4.4		Low Emitting Materials: Composite Wood & Agrifiber Products	Closeout		Spreadsheet indicating, for each indoor composite wood and agrifiber product used, the manufacturer, product name/model number, if it contains added urea formaldehyde (yes/no) and source of LEED compliance data.		PE
			Closeout	X	Manufacturer published product data or certification confirming material urea formaldehyde in spreadsheet		PE
EQ5		Indoor Chemical & Pollutant Source Control	Closeout		Spreadsheet indicating, for each permanent entryway system used, the manufacturer, product name/model number and description of system.		PE
			Final Design		List of drawing and specification references that convey locations and installation methods for entryway systems.		ARC
			Final Design		Spreadsheet indicating, for each chemical use area, the room number, room name, description of room separation features (walls, floor/ceilings, openings) and pressure differential from surrounding spaces with doors closed - OR - Statement confirming that project includes no chemical use areas and that no hazardous cleaning materials are needed for building maintenance.		ARC MEC
			Final Design		If project includes chemical use areas: List of drawing and specification references that convey locations of chemical use areas, room separation features and exhaust system.		ARC MEC

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PAR		**FEATURE**	**DUE AT**		**REQUIRED DOCUMENTATION**	**DATE**	**REV**
			Final Design		If project includes places where water and chemical concentrate mixing occurs: List of drawing and specification references that convey provisions for containment of hazardous liquid wastes OR - Statement confirming that project includes no places where water and chemical concentrate mixing occurs.		ARC MEC
			Closeout		If project includes chemical use areas: Spreadsheet indicating, for AHUs/mechanical ventilation equipment serving occupied areas, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy (yes/no) - OR - Statement confirming that project does not use mechanical equipment for ventilation of occupied areas.		PE
EQ6.1		Controllability of Systems: Lighting	Final Design		Calculation indicating total number of individual workstations, number of workstations with individual lighting controls and the percentage of workstations with individual lighting controls.		ELEC
			Final Design		For each shared multi-occupant space, provide a brief description of lighting controls.		ELEC
			Final Design		Narrative describing lighting control strategy, including type and location of individual controls and type and location of controls in shared multi-occupant spaces.		ELEC
EQ6.2		Controllability of Systems: Thermal Comfort	Final Design		Calculation indicating total number of individual workstations, number of workstations with individual thermal comfort controls and the percentage of workstations with individual thermal comfort controls.		MEC
			Final Design		For each shared multi-occupant space, provide a brief description of thermal comfort controls.		MEC
			Final Design		Narrative describing thermal comfort control strategy, including type and location of individual and shared multi-occupant controls.		MEC
EQ7.1		Thermal Comfort: Design	Final Design		Design criteria spreadsheet indicating, for spring, summer, fall and winter, maximum indoor space design temperature, minimum indoor space design temperature and maximum indoor space design humidity.		MEC
			Final Design		Narrative describing method used to establish thermal comfort control conditions and how systems design addresses the design criteria, including compliance with the referenced standard.		MEC
EQ7.2		Thermal Comfort: Verification	Final Design		Narrative describing the scope of work for the thermal comfort survey, including corrective action plan development		MEC
			Final Design		List of drawing and specification references that convey permanent monitoring system.		MEC
EQ8.1		Daylight & Views: Daylight 75% of Spaces	Final Design		Option 2: Table indicating all regularly occupied spaces with space area and space area with compliant daylight zone. Sum of regularly occupied areas and regularly occupied areas withcompliant daylight zone. Percentage calculation of areas withcompliant daylight zone to total regularly occupied areas.		ARC
			Final Design		Option 1: Simulation model method, software and output data		ELEC
			Final Design		Option 1: Table indicating all regularly occupied spaces with space area, space area with minimum 25 footcandles daylighting illumination, and method of providing glare control. Sum of regularly occupied areas and regularly occupied areas with 25 fc daylighting. Percentage calculation of areas with 25 fc daylighting to total regularly occupied areas.		ELEC
			Final Design		For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.		ARC
			Final Design		List of drawing and specification references that convey exterior glazed opening head and sill heights, glazing performance properties and glare control/sunlight redirection devices.		ARC
			Closeout	X	Manufacturer published product data or certification confirming glazing Tvis in spreadsheet		PE
EQ8.2		Daylight & Views: Views for 90% of Spaces	Final Design		Table indicating all regularly occupied spaces with space area and space area with access to views. Sum of regularly occupied areas and regularly occupied areas with access to views. Percentage calculation of areas with views to total regularly occupied areas.		ARC
			Final Design		For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.		ARC
			Final Design		LEED Floor plan drawings showing line of sight diagramming of views areas in each regularly occupied space. List of drawing/specification references that convey exterior glazed opening head and sill heights.		ARC
INNOVATION & DESIGN PROCESS							

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IDc1.1		Innovation in Design	Final Design		Narrative decribing intent, requirement for credit, project approach to the credit. List of drawings and specification references that convey implementation of credit. All other documentation that validates claimed credit.		
IDc1.2		Innovation in Design	Final Design				
IDc1.3		Innovation in Design	Final Design				
IDc1.4		Innovation in Design	Final Design				
IDc2		LEED Accredited Professional	Final Design		Narrative indicating name of LEED AP, company name of LEED AP, description of LEED AP's role and responsiblilities in the project.		ARC

ATTACHMENT F
Version 02-03-2010

BUILDING INFORMATION MODELING REQUIREMENTS

1.0 Section 1 - Submittal Format

1.1. Design Deliverables. Develop all designs using Building Information Modeling (BIM) and Computer Aided Design (CAD) software. Design submittal drawings shall be Full Size size, suitable for half-size scaled reproduction.

2.0 Section 2 – Design Requirements

2.1. BIM Model and Facility Data. Contractor shall use BIM application(s) and software(s) to develop project designs. "Facility Data" is defined as associated intelligent attribute data. The "Model" is defined as 3D graphics that includes Facility Data and output as described in the paragraph 'Output' below. Contractors will use the Model to produce accurate Construction Documents. For each Center of Standardization (CoS) facility type included in this project, all BIM Models and associated Facility Data shall be submitted in Bentley Systems BIM Building (XM) with associated USACE Bentley BIM Workspace (which includes specific standard BIM libraries and definitions). This Workspace can be downloaded from the CAD/BIM Technology Center. [Where available, the workspace will be specific to this CoS Facility Standard Design. The Contractor will be provided a baseline multi-discipline BIM Project Model for the CoS Facility Standard Design type, where such a model exists (for the purposes of site adaptation).] The USACE Bentley BIM Workspace is dependent on specific versions of the Bentley BIM suite of products and only the versions of the software that are listed in the Contractor instructions included with the USACE BIM Workspace are permitted to be used.

2.1.1. Reference. Refer to ERDC TR-06-10, "U.S. Army Corps of Engineers Building Information Modeling Road Map" from the CAD/BIM Technology Center website for more information on the USACE BIM implementation goals.

2.2. Drawings. Deliver CAD files used for the creation of the Construction Documents Drawings per requirements in Section 01 33 16, the criteria of the USACE Tulsa District, and as noted herein. Specification of a CAD file format for these Drawings does not limit which BIM application(s) or software(s) may be used for project development and execution.

2.2.1. IFC Support. The Contractor's selected BIM application(s) and software(s) must support the IFC (Industry Foundation Class - see www.iai-tech.org). Submit any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment for Government approval.

2.2.2. Submittal Requirements. BIM submittals shall be fully interoperable, compatible, and editable with the Bentley BIM tools. Use the specified version of the USACE Bentley BIM Workspace and conform to the requirements of **Sections 3 and 4 below**.

2.2.3. BIM Project Execution Plan.

2.2.3.1. Develop a BIM Project Execution Plan ("Plan" or "PxP") documenting the BIM and analysis technologies selected for the Project Model (integrated with the AEC CAD Standard) from concept development through As-Builts as a design, production, coordination, construction, and documentation tool and the collaborative process by which it shall be executed. See Section 7 for additional guidance on developing the Plan.

2.2.4. BIM Requirements..

2.2.4.1. Facility Data. Develop the Facility Data consisting of a set of intelligent elements for the Model (e.g., doors, air handlers, electrical panels). This Facility Data shall include all material definitions and attributes that are necessary for the Project facility design and construction. Additional data in support of Section 6 Contractor Electives is encouraged.

2.2.4.2. Model Content. The Model and Facility Data shall include, at a minimum, the requirements of Section 4 below.

2.2.4.3. Model Granularity. Models may vary in level of detail for individual elements within a model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g. at least 1/16th, 1/8th and 1/4th), or appropriately scaled civil drawings.

2.2.4.4. Output. Submitted CAD drawings (e.g., plans, elevations, sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) and maintained from the submitted Model and Facility Data.

2.3. Quality Control. Implement quality control (QC) parameters for the Model, including:

2.3.1. Model Standards Checks. QC validation used to ensure that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements. Report non-compliant elements and corrective action plan to correct non-compliant elements. Provide the government with detailed justification and request government approval for any non-compliant element which the contractor proposes to be allowed to remain in the Model.

2.3.2. CAD Standards Checks. QC checking performed to ensure that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per the A/E/C CADD Standard.

2.3.3. Other Parameters. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for concurrence.

2.4. Design and Construction Reviews. Perform design and construction reviews at each submittal stage under Section 3 to test the Model, including:

2.4.1. Visual Checks. Checking to ensure the design intent has been followed and that there are no unintended elements in the Model.

2.4.2. Interference Management Checks. Locate conflicting spatial data in the Model where two elements are occupying the same space. Log hard interferences (e.g., mechanical vs. structural or mechanical vs. mechanical overlaps in the same location) and soft interferences, (e.g., conflicts regarding equipment clearance, service access, fireproofing, insulation) in a written report and resolve.

2.4.3. IFC Coordination View. Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.

2.4.4. Other Parameters. Develop such other Review parameters as the Contractor deems appropriate for the Project and provide to the Government for concurrence..

3.0 Section 3 – Design Stage Submittal Requirements

3.1. General Submittal Requirements.

3.1.1. Provide submittals in compliance with BIM Project Execution Plan deliverables at stages as described hereinafter.

3.1.2. At each Stage in Paragraphs 3.3 through 3.6, provide a Contractor-certified written report confirming that consistency checks as identified in Paragraphs 2.3 and 2.4 have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.

3.1.3. At each Stage in Paragraphs 3.3 through 3.6, provide the Government with:

- The Model, Facility Data, Workspace and CAD Data files in native Bentley BIM/CAD.

- A 3-D interactive review format of the Model in Bentley Navigator, Autodesk Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or other format per Plan requirements. The file format for reviews can change between submittals.

- A list of all submitted files. The list should include a description, directory, and file name for each file submitted. For all CAD sheets, include the sheet title and sheet number. Identify files that have been produced from the submitted Model and Facility Data.

3.2. Initial Design Conference Submittal.

3.2.1. Submit a digital copy of the Plan where, in addition to Paragraph 3.1.4, the USACE Geographic District BIM Manager will coordinate with the USACE CoS BIM Manager to confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated.

3.2.2. Within thirty (30) days after the approval of the Plan, conduct a demonstration to review the Plan for clarification, and to verify the functionality of Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the Plan and perform subsequent demonstration for Government acceptance. There will be no payment for design or construction until the Plan is acceptable to the Government. The Government may also withhold payment for design and construction for unacceptable performance in executing the approved Plan.

3.3. Interim Design Submittals.

3.3.1. BIM and CAD Data. The Model shall include the requirements identified in Paragraph 2.2.4 as applicable to the Interim Design package(s).

3.4. Final Design Submissions and Design Complete Submittals.

3.4.1. BIM and CAD Data. The Model shall include the requirements identified in Paragraph 2.2.4. Acceptance according to Paragraph 3.1.4 is required before commencement of construction, as described in Paragraph 3.7.6 of Section 01 33 16.

3.5. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.

3.6. Final As-Builts BIM and CAD Data Submittal. Submit the final Model, Facility Data, and CAD files reflecting as-built conditions for Government Approval, as specified in Section 01 78 02.00 10, PROJECT CLOSEOUT.

4.0 Section 4 – BIM Model Minimum Requirements and Output

4.1. General Provisions. The deliverable Model shall be developed to include the systems described below as they would be built and the processes of installing them, and to reflect final as-built conditions. The deliverable model at the interim design stage and at the final design stage (“released for construction”) shall be developed to include as many of the systems described below as are necessary and appropriate at that design stage.

4.2. Architectural/Interior Design. The Architectural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.2.1. Spaces. The Model shall include spaces defining accurate net square footage and net volume, and holding data for the room finish schedule for including room names and numbers. Include Programmatic Information provided by the Government or validated program to verify design space against programmed space, using this information to validate area quantities.

4.2.2. Walls and Curtain Walls. Each wall shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect wall types. The Model shall include all walls, both interior and exterior, and the necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.2.3. Doors, Windows and Louvers. Doors, windows and louvers shall be depicted to represent their actual size, type and location. Doors and windows shall be modeled with the necessary intelligence to produce accurate window and door schedules.

4.2.4. Roof. The Model shall include the roof configuration, drainage system, penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

4.2.5. Floors. The floor slab shall be developed in the structural Model and then referenced by the architectural Model for each floor of the Project building.

4.2.6. Ceilings. All heights and other dimensions of ceilings, including soffits, ceiling materials, or other special conditions shall be depicted in the Model with the necessary intelligence to produce accurate plans, building sections and generic wall sections where ceiling design elements are depicted.

4.2.7. Vertical Circulation. All continuous vertical components (i.e., non-structural shafts, architectural stairs, handrails and guardrails) shall be accurately depicted and shall include the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.8. Architectural Specialties and Woodwork. All architectural specialties (i.e., toilet room accessories, toilet partitions, grab bars, lockers, and display cases) and woodwork (i.e., cabinetry and counters) shall be accurately depicted with the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.9. Signage. The Model shall include all signage and the necessary intelligence to produce accurate plans and schedules.

4.2.10. Schedules. Provide door, window, hardware sets using BHMA designations, flooring, wall finish, and signage schedules from the Model, indicating the type, materials and finishes used in the design.

4.3. Furniture. The furniture systems Model may vary in level of detail for individual elements within a Model, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing, and have necessary intelligence to produce accurate plans. Representation of furniture elements is to be 2D. Contractor may provide a minimal number of 3D representations as examples. Examples of furniture include, but are not limited to, desks, furniture systems, seating, tables, and office storage.

4.3.1. Furniture Coordination. Furniture that makes use of electrical, data or other features shall include the necessary intelligence to produce coordinated documents and data.

4.4. Equipment. The Model may vary in level of detail for individual elements within a Model. Equipment shall be depicted to meet layout requirements with the necessary intelligence to produce accurate plans and minimum schedules depicting their configuration. Examples of equipment include but are not limited to copiers, printers, refrigerators, ice machines and microwaves.

4.4.1. Schedules. Provide furniture and equipment schedules from the model indicating the materials, finishes, mechanical, and electrical requirements.

4.5. Structural. The structural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.5.1. Foundations. All necessary foundation and/or footing elements, with necessary intelligence to produce accurate plans and elevations

4.5.2. Floor Slabs. Structural floor slabs shall be depicted, including all necessary recesses, curbs, pads, closure pours, and major penetrations accurately depicted.

4.5.3. Structural Steel. All steel columns, primary and secondary framing members, and steel bracing for the roof and floor systems (including decks), including all necessary intelligence to produce accurate structural steel framing plans and related building/wall sections.

4.5.4. Cast-in-Place Concrete. All walls, columns, and beams, including necessary intelligence to produce accurate plans and building/wall sections depicting cast-in-place concrete elements.

4.5.5. Expansion/Contraction Joints. Joints shall be accurately depicted.

4.5.6. Stairs. The structural Model shall include all necessary openings and framing members for stair systems, including necessary intelligence to produce accurate plans and building/wall sections depicting stair design elements.

4.5.7. Shafts and Pits. The structural Model shall include all necessary shafts, pits, and openings, including necessary intelligence to produce accurate plans and building/wall sections depicting these design elements.

4.6. Mechanical. The mechanical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Small diameter (less than 1-1/2” NPS) field-routed piping is not required in the model. Additional minimum Model requirements include:

4.6.1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution ducts for supply, return, and ventilation and exhaust ducts, including control system, registers, diffusers, grills and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules.

4.6.1.1. Mechanical Piping. All necessary piping and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules.

4.6.2. Plumbing. All necessary plumbing piping and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules.

4.6.3. Equipment Clearances. All HVAC and Plumbing equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.6.4. Elevator Equipment. The Model shall include the necessary equipment and control system, including necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.7. Electrical/Telecommunications. The electrical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Small diameter (less than 1-1/2”Ø) field-routed conduit is not required in the model. Additional minimum Model requirements include:

4.7.1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards, cable trays and control systems), including necessary intelligence to produce accurate plans, details and schedules. Lighting and power built into furniture/equipment shall be modeled.

4.7.2. Special Electrical Systems. All necessary special electrical components (i.e., security, Mass Notification, Public Address, nurse call and other special occupancies, and control systems), including necessary intelligence to produce accurate plans, details and schedules.

4.7.3. Grounding Systems. Grounding Systems. All necessary grounding components (i.e., lightning protection systems, static grounding systems, communications grounding systems, bonding), including necessary intelligence to produce accurate plans, details and schedules.

4.7.4. Communications. All existing and new communications service controls and connections, both above ground and underground with necessary intelligence to produce accurate plans, details and schedules. Cable tray routing shall be modeled without detail of cable contents.

4.7.5. Exterior Building Lighting. All necessary exterior lighting with necessary intelligence to produce accurate plans, elevations and schedules. The exterior building lighting Model shall include all necessary lighting, relevant existing and proposed support utility lines and equipment required with necessary intelligence to produce accurate plans, details and schedules.

4.7.6. Equipment Clearances. The model shall incorporate and define all electrical and communications working spaces, clearances, and required access

4.8. Fire Protection. The fire protection system Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.8.1. Fire Protection System. All relevant fire protection components (i.e., branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors, control panels) with necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All fire protection piping shall be modeled.

4.8.2. Fire Alarms. Fire alarm/mass notification devices and detection system shall be indicated with necessary intelligence to produce accurate plans depicting them.

4.9. Civil. The civil Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1”=100’) scaled drawing. Additional minimum Model requirements include:

4.9.1. Terrain (DTM). All relevant site conditions and proposed grading, including necessary intelligence to produce accurate Project site topographical plans and cross sections.

4.9.2. Drainage. All existing and new drainage piping, including upgrades thereto, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.9.3. Storm Water and Sanitary Sewers. All existing and new sewer structures and piping, including upgrades thereto, on the Project site with necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.9.4. Utilities. All necessary new utilities connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, including necessary intelligence to produce accurate plans and site-sections.

4.9.5. Roads and Parking. All necessary roadways and parking lots or parking structures, including necessary intelligence to produce accurate plans, profiles and cross-sections.

5.0 Section 5 - Ownership and Rights in Data

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

6.0 Section 6 – Contractor Electives

6.1. Applicable Criteria. If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit during the source selection, as described in the proposal submission requirements and evaluation criteria, the following criteria are requirements, as applicable to those elective feature(s).

6.2. COBIE Compliance. The Model and Facility Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements as defined by the Whole Building Design Guide organization, including all requirements for the indexing and submission of Portable Document Format (PDF) and other appropriate file formats that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.

6.3. Project Scheduling using the Model. In the BIM Execution Plan and during the Preliminary BIM Execution Plan Review, provide an overview of the use of BIM in the development and support of the project construction schedule.

6.3.1. Submittal Requirements. During the Submittal stages, the Contractor shall deliver the construction schedule with information derived from the Model.

6.3.1.1. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for project scheduling.

6.4. Cost Estimating. In the BIM Execution Plan and during the Preliminary BIM Execution Plan Review, provide an overview of the use of BIM in the development and support of cost estimating requirements, or other applications such as cost analysis and estimate validation.

6.4.1. Submittal Requirements. During the Submittal stages, the Contractor shall deliver cost estimating information derived from the Model.

6.4.2. Project completion. At project completion, the Contractor shall provide an MII (Micro Computer Aided Cost Estimating System Generation II) Cost Estimate which follows the USACE Cost Engineering Military Work Breakdown System (WBS), a modified Uniformat, to at least the sub-systems level and uses quantity information supplied directly from BIM output to the maximum extent possible, though other "Gap" quantity information will be included as necessary for a complete and accurate cost estimate.

6.4.2.1. Sub system level extracted quantities from the BIM for use within the estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. Therefore, when developing a BIM, the designer shall be cognizant of what tasks need to be separated appropriately at the beginning stages of model development, such as tasks done on the first floor versus the same task on higher floors that will be more labor intensive and therefore need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the BIM shall be broken done by their location (proximity in the structure) as well as the complexity of its installation.

6.4.2.2. At all design stages it shall be understood that BIM output as described in this document will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the project based on the design. An example of this would be plumbing that is less than 1.5" diameter and therefore not expected to be modeled due to granularity; this information is commonly referred to as The Gap. Quantities from The Gap and their associated costs shall be included in the final project actual cost estimates as well.

6.5. Other Analyses and Reports. Structural, energy and efficiency, EPACT 2005 & EISA 2007, lighting design, daylighting, electrical power, psychrometric processing, shading, programming, LEED, fire protection, code compliance, Life Cycle Cost, acoustic, plumbing.

7.0 Section 7 – BIM Project Execution Plan Template

7.1. Contractors will utilize the latest version of the USACE BIM PROJECT EXECUTION PLAN (USACE PxP) Template to develop an acceptable Plan. The template can be downloaded from the CAD/BIM Technology Center website.

ATTACHMENT G
DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT

Organize electronic design submittal files in a subdirectory/file structure in accordance with the following table. The Contractor may suggest a slightly different structure, subject to the discretion of the government.

Design Submittal Directory and Subdirectory File Arrangement.

Directory	Sub-Directory	Sub-Directory or Files	Files
Submittal/Package Name	Narratives	PDF file or files with updated design narrative for each applicable design discipline	
	Drawings	PDF (subdirectory)	Single PDF file with all applicable drawing sheets - bookmarked by sheet number and name
		BIM (subdirectory) See Attachment F.	BIM project folder (with files) per the USACE Workspace. Include an Excel drawing index file with each drawing sheet listed by sheet #, name and corresponding dgn file name (Final Design & Design Complete only)
	Design Analysis & Calculations	Individual PDF files containing design analysis and calculations for each discipline applicable to the submittal	
		PDF file with Fire Protection and Life Safety Code Review checklist	
	LEED	PDF file with updated Leed Check List	
		PDF file or files with LEED Templates for each point with applicable documentation included in each file.	
		LEED SUBMITTALS	
	Energy Analysis	PDF with baseline energy consumption analysis	
		PDF with actual building energy consumption analysis	
	Specifications	Single PDF file with table of contents and all applicable specifications sections.	
		Submittal Register (Final Design & Design Complete submittal only)	
	Design Quality Control	PDF file or files with DQC checklist(s) and/or statements	
	Building Rendering(s)	PDF file of rendering for each building type included in contract (Final Design & Design Complete).	

SECTION 01 45 01.10
QUALITY CONTROL SYSTEM (QCS)

1.0 GENERAL

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

1.2. QCS SOFTWARE

1.3. SYSTEM REQUIREMENTS

1.4. RELATED INFORMATION

1.5. CONTRACT DATABASE

1.6. DATABASE MAINTENANCE

1.7. IMPLEMENTATION

1.8. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

1.9. MONTHLY COORDINATION MEETING

1.10. NOTIFICATION OF NONCOMPLIANCE

1.0 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Request for Information
- Accident Reporting
- Safety Exposure Manhours

1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.2. OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10, PROJECT SCHEDULE, Section 01 33 00, SUBMITTAL PROCEDURES, and Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.3. QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.4. SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

(a) Hardware

- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256 MB RAM for workstation / 512+ MB RAM for server
- 1 GB hard drive disk space for sole use by the QCS system
- Compact disk (CD) Reader, 8x speed or higher
- SVGA or higher resolution monitor (1024 x 768, 256 colors)
- Mouse or other pointing devise
- Windows compatible printer (Laser printer must have 4+ MB of RAM)
- Connection to the Internet, minimum 56K BPS

(b) Software

- MS Windows 2000 or higher
- MS Word 2000 or newer
- Latest version of : Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail), MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

1.5. RELATED INFORMATION

1.5.1. QCS USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.5.2. CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.6. CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.7. DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government, e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc. shall be submitted using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or CD-ROM may be used instead (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

1.7.1. ADMINISTRATION

1.7.1.1. Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format.

1.7.1.2. Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format.

1.7.1.3. Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main)

office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

All Requests For Information (RFI) shall be exchanged using the Built-in RFI generator and tracker in QCS.

1.7.1.4. Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.7.1.5. Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.7.2. FINANCES

1.7.2.1. Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the design and construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.7.2.2. Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet prompt payment certification, and payment invoice in QCS. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment request, prompt payment certification, and payment invoice with supporting data by using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, E-mail or a CD-ROM may be used. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.7.3. Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.7.3.1. Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government within 24 hours after the date covered by the report. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.7.3.2. Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.7.3.3. QC Requirements

The Contractor shall develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.7.3.4. Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.7.3.5. Labor and Equipment Hours

The Contractor shall log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

1.7.3.6. Accident/Safety Tracking Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This supplemental entry is not to be considered as a substitute for completion of mandatory notification and reports, e.g., ENG Form 3394 and OSHA Form 300.

1.7.3.7. Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.7.3.8. Hazard Analysis

The Contractor shall use QCS to develop a hazard analysis for each feature of work included in its CQC Plan. The hazard analysis shall address any hazards, or potential hazards, that may be associated with the work

1.7.4. Submittal Management

The Government will provide the submittal register form, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. The Contractor and Designer of Record (DOR) shall develop and maintain a complete list of all submittals, including completion of all data columns and shall manage all submittals. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.7.5. Schedule

The Contractor shall develop a design and construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.7.5.1. Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data from RMS, and schedule data using SDEF.

1.8. IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.9. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of QCS data is by using the government's SFTP repository built into QCS export function.. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of CD-ROM for data transfer. Data on CDs shall be exported using the QCS built-in export function. If used, CD-ROMs will be submitted in accordance with the following:

1.9.1. File Medium

The Contractor shall submit required data on CD-ROMs. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.9.2. Disk Or Cd-Rom Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.9.3. File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software shall not be altered in any way by the Contractor.

1.10. MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.11. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

End of Section 01 45 01.10

SECTION 01 45 04.00 10
CONTRACTOR QUALITY CONTROL

1.0 GENERAL

1.1. REFERENCES

1.2. PAYMENT

2.0 PRODUCTS (NOT APPLICABLE)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

3.2. QUALITY CONTROL PLAN

3.3. COORDINATION MEETING

3.4. QUALITY CONTROL ORGANIZATION

3.5. SUBMITTALS AND DELIVERABLES

3.6. CONTROL

3.7. TESTS

3.8. COMPLETION INSPECTION

3.9. DOCUMENTATION

3.10. NOTIFICATION OF NONCOMPLIANCE

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to the latest edition, as of the date of the contract solicitation.

- ASTM INTERNATIONAL (ASTM)
- ASTM D 3740 Minimum Requirements for Agencies

  Engaged in the Testing and/or Inspection
  of Soil and Rock as Used in Engineering
  Design and Construction
- ASTM E 329 Agencies Engaged in the Testing

  and/or Inspection of Materials Used in
  Construction
- U.S. ARMY CORPS OF ENGINEERS (USACE)

  ER 1110-1-12 Quality Management

1.2. PAYMENT

There will be no separate payment for providing and maintaining an effective Quality Control program. Include all costs associated therewith in the applicable unit prices or lump-sum prices contained in the Contract Line Item Schedule.

2.0 PRODUCTS (Not Applicable)

3.0 EXECUTION

3.1. GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence. The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2. QUALITY CONTROL PLAN

Furnish for Government review, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Design and construction may begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. The Government will not permit work outside of the features of work included in an accepted interim plan to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started. Where the applicable Code issued by the International Code Council calls for an inspection by the Building Official, the Contractor shall include the inspections in the Quality Control Plan and shall perform the inspections. The Designer of Record shall develop a program for any special inspections required by the applicable International Codes and the Contractor shall perform these inspections, using qualified inspectors. Include the special inspection plan in the QC Plan.

3.2.1. Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

3.2.1.1. A description of the quality control organization. Include a chart showing lines of authority and an acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. A CQC System Manager shall report to the project superintendent or someone higher in the contractor's organization.

3.2.1.2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Also include those responsible for performing and documenting the inspections required by the International Codes and the special inspection program developed by the designer of record.

3.2.1.3. A copy of the letter to the CQC System Manager, signed by an authorized official of the firm, which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Furnish copies of these letters.

3.2.1.4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

3.2.1.5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Use only Government approved Laboratory facilities.

3.2.1.6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

3.2.1.7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

3.2.1.8. Reporting procedures, including proposed reporting formats.

3.2.1.9. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.1.10. A list of all inspections required by the International Codes and the special inspection program required by the code and this contract.

3.2.2. Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

3.2.2.1. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall review all documents. Use personnel who were not involved in the design effort to produce the design to perform the independent technical review (ITR). The ITR is intended as a quality control check of the design. Include, at least, but not necessarily limited to, a review of the contract requirements (the accepted contract or task order proposal and amended RFP), the basis of design, design calculations, the design configuration management documentation and check the design documents for

errors, omissions, and for coordination and design integration. The ITR team is not required to examine, compare or comment concerning alternate design solutions but should concentrate on ensuring that the design meets the contract requirements. Correct errors and deficiencies in the design documents prior to submitting them to the Government.

3.2.2.2. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists at each design phase as part of the project documentation.

3.2.2.3. A Design Quality Control Manager, who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated, shall implement the DQC Plan This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Government, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

3.2.3. Acceptance of Plan

Government acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4. Notification of Changes

After acceptance of the CQC Plan, notify the Government in writing of any proposed change. Proposed changes are subject to Government acceptance.

3.3. COORDINATION MEETING

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor and the Government shall meet and discuss the Contractor's quality control system. Submit the CQC Plan for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. The Government will prepare minutes of the meeting for signature by both parties. . The minutes shall become a part of the contract file. There may be occasions when either party will call for subsequent conferences to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4. QUALITY CONTROL ORGANIZATION

3.4.1. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure contract compliance. The CQC organization shall also include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. Provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly furnish complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System

Manager shall be a graduate engineer, graduate architect, or a BA/BS graduate of an ACCE accredited construction management college program. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Officer, if qualified and if allowed by Section 00 73 00). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

3.4.3. CQC Personnel

3.4.3.1. In addition to CQC personnel specified elsewhere in the contract provide specialized CQC personnel to assist the CQC System Manager in accordance with paragraph titled Area Qualifications.

3.4.3.2. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; **are not intended to be full time, but must be physically present at the construction site during work on their areas of responsibility**; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. **One person may cover more than one area, provided that they are qualified to perform QC activities for the designated areas below and provided that they have adequate time to perform their duties:**

3.4.4. Experience Matrix

3.4.4.1. Area Qualifications

3.4.4.1.1. Civil - Graduate Civil Engineer or (BA/BS) graduate in construction management with 4 years experience in the type of work being performed on this project or engineering technician with 5 yrs related experience.

3.4.4.1.2. Mechanical - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Mechanical Inspector with 5 yrs related experience.

3.4.4.1.3. Electrical - Graduate Electrical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Electrical Inspector with 5 yrs related experience.

3.4.4.1.4. Structural - Graduate Structural Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or person with an ICC certification as a Reinforced Concrete Special Inspector and Structural Steel and Bolting Special Inspector (as applicable to the type of construction involved) with 5 yrs related experience.

3.4.4.1.5. Plumbing - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience, or person with an ICC certification as a Commercial Plumbing Inspector with 5 yrs related experience.

3.4.4.1.6. Concrete, Pavements and Soils Materials Technician (present while performing tests) with 2 yrs experience for the appropriate area

3.4.4.1.7. Testing, Adjusting and Balancing Specialist must be a member (TAB) Personnel of AABC or an experienced technician of the firm certified by the NEBB (present while testing, adjusting, balancing).

3.4.4.1.8. Design Quality Control Manager Registered Architect or Professional Engineer (not required on the construction site)

3.4.4.1.9. Registered Fire Protection Engineer with 4 years related experience or engineering technician with 5 yrs related experience (but see requirements for Fire Protection Engineer of Record to witness final testing in Section 01 10 00, paragraph 5.10, Fire Protection).

3.4.4.1.10. QC personnel assigned to the installation of the telecommunication system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification. In lieu of BICSI certification, QC personnel shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. QC personnel shall witness and certify the testing of telecommunications cabling and equipment.

3.4.5. Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is periodically offered at Tulsa District Office, 1645 S. 101 E. Ave., Tulsa, OK. Inquire of the District or Division sponsoring the course for fees and other expenses involved, if any, for attendance at this course.

3.4.6. Organizational Changes

When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5. SUBMITTALS AND DELIVERABLES

Make submittals as specified in Section 01 33 00 ***SUBMITTAL PROCEDURES***. The CQC organization shall certify that all submittals and deliverables are in compliance with the contract requirements.

3.6. CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The CQC organization shall conduct at least three phases of control for each definable feature of the construction work as follows:

3.6.1. Preparatory Phase

Perform this phase prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

3.6.1.1. A review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Government personnel until final acceptance of the work.

3.6.1.2. A review of the contract drawings.

3.6.1.3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

3.6.1.4. Review of provisions that have been made to provide required control inspection and testing.

3.6.1.5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

3.6.1.6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

3.6.1.7. A review of the appropriate activity hazard analysis to assure safety requirements are met.

3.6.1.8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

3.6.1.9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

3.6.1.10. Discussion of the initial control phase.

3.6.1.11. Notify the Government at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2. Initial Phase

Accomplish this phase at the beginning of a definable feature of work. Include the following actions:

3.6.2.1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

3.6.2.2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

3.6.2.3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

3.6.2.4. Resolve all differences.

3.6.2.5. Check safety to include compliance with and upgrading of the Accident Prevention plan and activity hazard analysis. Review the activity analysis with each worker.

3.6.2.6. Notify the Government at least 24 hours in advance of beginning the initial phase. The CQC System Manager shall prepare and attach to the daily CQC report separate minutes of this phase. Indicate exact location of initial phase for future reference and comparison with follow-up phases.

3.6.2.7. Repeat the initial phase any time acceptable specified quality standards are not being met.

3.6.3. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

3.6.4. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7. TESTS

3.7.1. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and project design documents. Upon request, furnish to the Government

duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory, or establish an approved testing laboratory at the project site. The Contractor may elect to use a laboratory certified and accredited by the Concrete and cement Reference Laboratory (CCRL) or by AASHTO Materials Reference Laboratory (AMRL) for testing procedures that those organizations certify. The Contractor shall perform the following activities and record and provide the following data:

3.7.1.1. Verify that testing procedures comply with contract requirements and project design documents.

3.7.1.2. Verify that facilities and testing equipment are available and comply with testing standards.

3.7.1.3. Check test instrument calibration data against certified standards.

3.7.1.4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

3.7.1.5. Include results of all tests taken, both passing and failing tests, recorded on the CQC report for the date taken. Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2. Testing Laboratories

3.7.2.1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2. Capability Recheck

If the selected laboratory fails the capability check, the Government will assess the Contractor a charge of $1,375 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4. Furnishing or Transportation of Samples for Government Quality Assurance Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

- For delivery by mail:

  As directed by the Contracting Officer

  As directed

  As directed

  As directed
- For other deliveries:

  As directed by the Contracting Officer

As directed

As directed

As directed

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

3.8. COMPLETION INSPECTION

3.8.1. Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. Prepare a punch list of items which do not conform to the approved drawings and specifications and include in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2. Pre-Final Inspection

As soon as practicable after the notification above, the Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. Accomplish these inspections and any deficiency corrections required by this paragraph within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall attend the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups and major commands may also attend. The Government will formally schedule the final acceptance inspection based upon results of the Pre-Final inspection. Provide notice to the Government at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9. DOCUMENTATION

3.9.1. Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers using government-provided software, QCS (see Section 01 45 01.10). The report includes, as a minimum, the following information:

3.9.1.1. Contractor/subcontractor and their area of responsibility.

3.9.1.2. Operating plant/equipment with hours worked, idle, or down for repair.

3.9.1.3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

3.9.1.4. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the applicable control phase (Preparatory, Initial, Follow-up). List deficiencies noted, along with corrective action.

3.9.1.5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

3.9.1.6. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

3.9.1.7. Offsite surveillance activities, including actions taken.

3.9.1.8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

3.9.1.9. Instructions given/received and conflicts in plans and/or specifications.

3.9.1.10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identity of the ITR team, the ITR review comments, responses and the record of resolution of the comments.

3.9.2. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, submit one report for every 7 days of no work and on the last day of a no work period. Account for all calendar days throughout the life of the contract. The first report following a day of no work shall be for that day only. The CQC System Manager shall sign and date reports. The report shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. The Contractor may submit these forms electronically, in lieu of hard copy.

3.10. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

End of Section 01 45 04.00 10

SECTION 01 50 02
TEMPORARY CONSTRUCTION FACILITIES

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

1.5. MAINTENANCE OF CONSTRUCTION SITE

1.0 OVERVIEW

1.1. GENERAL REQUIREMENTS

1.1.1. Site Plan

Prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Also indicate if the use of a supplemental or other staging area is desired.

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1. See Section 00 72 00, Contract Clauses and Section 00 73 00, Special Contract Requirements, for Utility Availability requirements.

1.2.2. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.3. Telephone

Make arrangements and pay all costs for desired telephone facilities.

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1. Bulletin Board

Immediately upon beginning of onsite work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Display legible copies of the aforementioned data until work is completed. Remove the bulletin board from the site upon completion of the project.

1.3.2. Project and Safety Signs

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try http://www.usace.army.mil/publications/eng-pamphlets/ep310-1-6a/s-16.pdf.

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

Provide access and temporary relocated roads as necessary to maintain traffic. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Take measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property.

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. Investigate the adequacy of existing roads and the allowable load limit on these roads. Repair any damage to roads caused by construction operations.

1.4.1. Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct haul roads with suitable grades and widths. Avoid sharp curves, blind corners, and dangerous cross traffic. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Provide adequate lighting to assure full and clear visibility for full width of haul road and work areas during any night work operations. Remove haul roads designated by the Contracting Officer upon completion of the work and restore those areas.

1.4.2. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5. MAINTENANCE OF CONSTRUCTION SITE

Mow grass and vegetation located within the boundaries of the construction site for the duration of the project, from NTP to contract completion. Edge or neatly trim grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers from NTP to contract completion.

End of Section 01 50 02

SECTION 01 57 20.00 10
ENVIRONMENTAL PROTECTION

1.0 GENERAL REQUIREMENTS

1.1. SUBCONTRACTORS

1.2. ENVIRONMENTAL PROTECTION PLAN

1.3. PROTECTION FEATURES

1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

1.5. NOTIFICATION

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1. LAND RESOURCES

3.2. WATER RESOURCES

3.3. AIR RESOURCES

3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

3.5. RECYCLING AND WASTE MINIMIZATION

3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

3.7. BIOLOGICAL RESOURCES

3.8. INTEGRATED PEST MANAGEMENT

3.9. PREVIOUSLY USED EQUIPMENT

3.10. MILITARY MUNITIONS

3.11. TRAINING OF CONTRACTOR PERSONNEL

3.12. POST CONSTRUCTION CLEANUP

1.0 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations

1.1. SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

1.2. ENVIRONMENTAL PROTECTION PLAN

1.2.1. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Define issues of concern within the Environmental Protection Plan as outlined in this section. Address each topic in the plan at a level of detail commensurate with the environmental issue and required construction task(s). Identify and discuss topics or issues which are not identified in this section, but which the Contractor considers necessary, after those items formally identified in this section. Prior to commencing construction activities or delivery of materials to the site, submit the Plan for review and Government approval. The Contractor shall meet with the Government prior to implementation of the Environmental Protection Plan, for the purpose of discussing the implementation of the initial plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. Maintain and keep the Environmental Protection Plan current onsite.

1.2.2. Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

1.2.3. Contents

The plan shall include, but shall not be limited to, the following:

1.2.3.1. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

1.2.3.2. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable

1.2.3.3. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel

1.2.3.4. Description of the Contractor's environmental protection personnel training program

1.2.3.5. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. Include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

1.2.3.6. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site

1.2.3.7. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

1.2.3.8. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

1.2.3.9. Drawing showing the location of on-installation borrow areas.

1.2.3.10. A spill control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The spill control plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

(a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Government and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.

(b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup

(c) Training requirements for Contractor's personnel and methods of accomplishing the training

(d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

(e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency

(f) The methods and procedures to be used for expeditious contaminant cleanup

1.2.3.11. A solid waste management plan identifying waste minimization, collection, and disposals methods, waste streams (type and quantity), and locations for solid waste diversion/disposal including clearing debris and C&D waste that is diverted (salvaged, reused, or recycled). Detail the contractor's actions to comply with, and to participate in, Federal, state, regional, local government, and installation sponsored recycling programs to reduce the volume of solid waste at the source. Identify any subcontractors responsible for the transportation, salvage and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility. Attach evidence of the facility's ability to accept the solid waste to this plan. A construction and demolition waste management plan, similar to the plan specified in the UFGS 01 74 19 (formerly 01572) may be used as the non-hazardous solid waste management plan. Provide a Non-Hazardous Solid Waste Diversion Report. Submit the report on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and each quarter thereafter (e.g. the first working day of January, April, July, and October) until the end of the project. Additionally, a summary report, with all data fields, is required at the end of the project. The report shall indicate the total type and amount of waste generated, total type and amount of waste diverted, type and amount of waste sent to waste-to-energy facility and alternative daily cover, in tons along with the percent that was diverted. Maintain, track and report construction and demolition waste data in a manner such that the installation can enter the data into the Army SWAR database, which separates data by type of material. A cumulative report in LEED Letter Template format may be used but must be modified to include the date disposed of/diverted and include the above stated diversion data. NOTE: The Solid Waste Diversion Reports are separate documentation that the LEED documentation.

1.2.3.12. DELETED.

1.2.3.13. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

1.2.3.14. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of

these materials. In accordance with EM 385-1-1, include a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time in the contaminant prevention plan. Update the plan as new hazardous materials are brought on site or removed from the site. Reference this plan in the storm water pollution prevention plan, as applicable.

1.2.3.15. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented and any required permits. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, include documentation that the waste water treatment plant Operator has approved the flow rate, volume, and type of discharge.

1.2.3.16. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Government.

1.2.3.17. A pesticide treatment plan, updated, as information becomes available. Include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation specific requirements. Follow AR 200-5 Pest Management, Chapter 2, Section III "Pest Management Records and Reports" for data required to be reported to the Installation.

1.3. PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Government shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Government will sign this survey, upon mutual agreement as to its accuracy and completeness. The Contractor develop a plan that depicts how it will protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Government and may require an extended review, processing, and approval time. The Government reserves the right to disapprove alternate methods, even if they are more cost effective, if the Government determines that the proposed alternate method will have an adverse environmental impact.

1.5. NOTIFICATION

The Government will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Government of the proposed corrective action and take such action when approved by the Government. The Government may issue an order stopping all or part of the

work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Government may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

2.0 PRODUCTS (NOT USED)

3.0 EXECUTION

3.1. LAND RESOURCES

Confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. Do not attach or fasten any ropes, cables, or guys to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Remove all stone, soil, or other materials displaced into uncleared areas..

3.1.1. Work Area Limits

Prior to commencing construction activities, mark the areas that need not be disturbed under this contract. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. Personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

3.1.2. Landscape

Clearly identify trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

3.1.3. Erosion and Sediment Controls

Provide erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. Coordinate with approving authorities (federal, state, etc.) for specific requirements to be included in the plan. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. Keep the area of bare soil exposed at any one time by construction operations to a minimum necessary. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

3.1.4. Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Government. Make only approved temporary movement or relocation of Contractor facilities. Provide erosion and sediment controls for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant and/or work areas to protect adjacent areas.

3.2. WATER RESOURCES

Monitor construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. Monitor all water areas affected by construction activities. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by state or federally issued Clean Water Act permits.

3.2.1. Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments or impede state-designated flows.

3.2.2. Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

3.3. AIR RESOURCES

Comply with all Federal and State air emission and performance laws and standards for equipment operation, activities, or processes.

3.3.1. Particulates

Control dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods are permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

3.3.2. Odors

Control odors from construction activities at all times. Odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

3.3.3. Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the state and Installation rules.

3.3.4. Burning

Burning is not allowed on the project site unless specified in other sections of the specifications or by written authorization. Specific times, locations, and manners of burning shall be subject to approval.

3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

3.4.1. Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Conduct handling, storage, and disposal to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The minimum acceptable off-site solid waste disposal option is a Subtitle D RCRA permitted landfill. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.4.2. Chemicals and Chemical Wastes

Dispense chemicals, ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. The Government may periodically review this documentation. Collect chemical waste in corrosion resistant, compatible containers. Monitor and remove collection drums to a staging or storage area when contents are within 6 inches of the top. Classify, manage, store, and dispose of wastes in accordance with Federal, State, and local laws and regulations.

3.4.3. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable state and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes; protect it from the weather by placing it in a safe covered location and take precautionary measures, such as berming or other appropriate measures, against accidental spillage. Store, describe, package, label, mark, and placard hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, state, and local laws and regulations. Transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Immediately report spills of hazardous or toxic materials to the Government and the Facility Environmental Office. Contractor will be responsible for cleanup and cleanup costs due to spills. Contractor is responsible for the disposition of Contractor generated hazardous waste and excess hazardous materials.

3.4.4. Fuel and Lubricants

Conduct storage, fueling and lubrication of equipment and motor vehicles in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

3.5. RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. Line and berm fueling areas and establish storm water control structures at discharge points for site run-off. Keep a liquid containment clean-up kit available at the fueling area.

3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. Protect and preserve these resources during the life of the Contract. Temporarily suspend all activities that may damage or alter such resources, if any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found during excavation or other construction activities. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, notify the Government so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

3.7. BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitat. Protect threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

3.8. INTEGRATED PEST MANAGEMENT

Coordinate, through the Government, with the Installation Pest Management Coordinator (IPMC) at the earliest possible time prior to pesticide application, in order to minimize impacts to existing fauna and flora. Discuss

integrated pest management strategies with the IPMC and receive concurrence from the IPMC, through the COR, prior to the application of any pesticide associated with these specifications. Give IMPC personnel the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. The use and management of pesticides are regulated under 40 CFR 152 - 186.

3.8.1. Pesticide Delivery and Storage

Deliver pesticides, approved for use on the Installation, to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

3.8.2. Qualifications

Use the services of a subcontractor for pesticide application whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

3.8.3. Pesticide Handling Requirements

Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions.

3.8.4. Application

A state certified pesticide applicator shall apply pesticides in accordance with EPA label restrictions and recommendations.

3.9. PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

3.10. MILITARY MUNITIONS

Immediately stop work in that area and immediately inform the Government, in the event military munitions, as defined in 40 CFR 260, are discovered or uncovered.

3.11. TRAINING OF CONTRACTOR PERSONNEL

Train personnel in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. The training and meeting agenda shall include methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

3.12. POST CONSTRUCTION CLEANUP

Clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing , obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade, fill and seed the entire disturbed area, unless otherwise indicated.

SECTION 01 62 35
RECYCLED/RECOVERED MATERIAL

1.0 GENERAL

1.1. REFERENCES

1.2. OBJECTIVES

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

1.0 GENERAL

1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2. OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials, when incorporated into the work under this contract, shall contain at least the minimum percentage of recycled or recovered materials indicated by EPA unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be use by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

End of Section 01 62 35

SECTION 01 78 02.00 10
CLOSEOUT SUBMITTALS

1.0 OVERVIEW

1.1. SUBMITTALS

1.2. PROJECT RECORD DOCUMENTS

1.3. EQUIPMENT DATA

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

1.6. OPERATION AND MAINTENANCE MANUALS

1.7. FIELD TRAINING

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

1.9. LEED REVIEW MEETINGS

1.10. RED ZONE MEETING

1.11. FINAL CLEANING

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

EXHIBIT 1 SAMPLE RED ZONE MEETING CHECKLIST

1.0 OVERVIEW

1.1. SUBMITTALS

Government approval is required for any submittals with a "G" designation; submittals not having a "G" designation are for Designer of Record approval or for information only. Submit the following in accordance with Section 01 33 00 submittals***:***

SD-02 Shop Drawings

– As-Built Drawings - G

▪ Drawings showing final as-built conditions of the project. Provide electronic drawing files as specified in Section 01 33 16, 3 sets of blue-line prints and one set of the approved working as-built drawings.

SD-03 Product Data

– As-Built Record of Equipment and Materials

▪ Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

– Construction Warranty Management Plan

▪ Three sets of the construction warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

– Warranty Tags

▪ Two record copies of the warranty tags showing the layout and design.

– Final Cleaning

▪ Two copies of the listing of completed final clean-up items.

1.2. PROJECT RECORD DOCUMENTS

1.2.1. As-Built Drawings – G

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

1.2.2. Maintenance of As-Built Drawings

1.2.2.1. The Configuration Management Plan shall describe how the Contractor will maintain up-to-date drawings, how it will control and designate revisions to the drawings and specifications (In accordance with Special Contract Requirement: ***Deviating from the Accepted Design*** and Section 01 33 16: ***Design after Award***, the Designer of Record's approval is necessary for any revisions to the accepted design).

1.2.2.2. Make timely updates, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the construction drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Perform this update no less frequently than weekly for the blue line drawings and update no less frequently than quarterly for the CADD/CAD and BIM files, which were prepared previously in accordance with Section 01 33 16. Include a confirmation that the as-builts are up to date with the submission of the monthly project schedule.

1.2.2.3. If the DB Contractor fails to maintain the as-built drawings as required herein, the Government will retain from the monthly progress payment, an amount representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole will be withheld until the Contractor submits acceptable as-built drawings and the Government approves them.

1.2.2.4. The marked-up set of drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

1.2.2.5. Typically, room numbers shown on the drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

1.2.2.6. If there is no separate contract line item (CLIN) for as-built drawings, the Government will withhold the amount of $35,000, or 1% of the present construction value, whichever is the greater, until the final as-built drawing submittal has been approved by the Government.

1.2.3. Underground Utilities

The drawings shall indicate, in addition to all changes and corrections, the actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Locate Valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record average elevation of the top of each run or underground structure..

1.2.4. Partial Occupancy

For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, supply as-built drawings for those portions of the facility being occupied or activated at the time the facility is occupied or activated. Show this same as-built information previously furnished on the final set of as-built drawings.

1.2.5. As-Built Conditions That are Different From the construction Drawings

Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the construction drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in CADD format. Reference the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing shall reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected clearly reflect options selected on final as-built drawings.

1.2.6. Additional As-Built Information that Exceeds the Detail Shown on the construction Drawings:

These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop drawings. It is recognized that these shop drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the construction drawings, piping, and equipment drawings. Include locations of all explorations, logs of all explorations, and results of all laboratory testing, including those provided by the Government. Furnish all such shop drawings in CADD /CADformat. Include fire protection details, such as wiring, performed for the design of the project.

1.2.7. Final As-Built Drawings

Submit final as-built CADD/CAD and BIM Model(s) and Facility Data files at the time of Beneficial Occupancy of the project or at a designated phase of the project. In the event the Contractor accomplishes additional work after this submittal, which changes the as-built conditions, submit a new DVD with all drawing sheets and three blue-line copies of affected sheets which depict additional changes.

1.2.8. Title Blocks

In accordance with the configuration management plan, clearly mark title blocks to indicate final as-built drawings.

1.2.9. Other As-Built Documents

Provide scans of all other documents such as design analysis, catalog cuts, certification documents that are not available in native electronic format in an organized manner in Adobe.pdf format.

1.2.9.1. LEED Documentation

Update LEED documentation on at least a monthly basis and have it available for review by the Government on the jobsite at all times during construction. Submit the final LEED Project Checklist(s), final LEED submittals checklist and complete project documentation, verifying the final LEED score and establishing the final rating. Provide full support to the validation review process, including credit audits. See also the LEED documentation requirements in Section 01 33 16, DESIGN AFTER AWARD.

1.2.9.2. GIS Documentation

Provide final geo-referenced GIS database of the new building footprint along with any changes made to exterior of the building. The intent of capturing the final building footprint and exterior modifications in a GIS database is to provide the installation with a data set of the comprehensive changes made to the landscape as a result of the construction project. The Government will incorporate this data set into the installations existing GIS MasterPlan or Enterprise GIS system. The GIS database deliverable shall follow a standard template provided to the Contractor by the Government, adhere to detailed specifications outlined in ECB No 2006-15, and be documented using the Federal Geographic Data Committee (FGDC) metadata standard.

1.3. EQUIPMENT DATA

1.3.1. Real Property Equipment

Provide an Equipment-in-Place list of all installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, provide the following information: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Furnish the list as one (1) reproducible and three (3) copies thirty (30) calendar days before completion of any segment of the contract work which has an incremental completion date.

1.3.2. Maintenance and Parts Data

Furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication showing detailed parts data on all other equipment subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

1.3.3. Construction Specifications

Furnish permanent electronic files of final as-built construction specifications, including modifications thereto, with the as-built drawings.

1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.4.1. Prior to the end of the one year warranty, the Government may conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". The Contractor shall replace all damaged materials and locate and repair sources of moisture penetration.

1.4.2. Management

1.4.2.1. Warranty Management Plan

Develop a warranty management plan containing information relevant to the clause ***Warranty of Construction*** in FAR 52.246-21. Submit the warranty management plan for Government approval at least 30 days before the planned pre-warranty conference. In the event of phased turn-over of the contract, update the Warranty Management Plan as necessary to include latest information required. Include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Submit warranty information made available during the construction phase prior to each monthly pay estimate. Assemble information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. The Contractor, Government, including the Customer Representative shall jointly conduct warranty inspections, 4 months and 9 months, after acceptance. The warranty management plan shall include, but shall not be limited to, the following information:

(1) Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, subcontractors, manufacturers or suppliers involved.

(2) Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

(3) A list for each warranted equipment, item, feature of construction or system indicating:

(i) Name of item.

(ii) Model and serial numbers.

(iii) Location where installed.

(iv) Name and phone numbers of manufacturers or suppliers.

(v) Names, addresses and telephone numbers of sources of spare parts.

(vi) Warranties and terms of warranty. Include one-year overall warranty of construction. Indicate those items, which have extended warranties with separate warranty expiration dates.

(vii) Cross-reference to warranty certificates as applicable.

(viii) Starting point and duration of warranty period.

(ix) Summary of maintenance procedures required to continue the warranty in force.

(x) Cross-reference to specific pertinent Operation and Maintenance manuals.

(xi) Organization, names and phone numbers of persons to call for warranty service.

(xii) Typical response time and repair time expected for various warranted equipment.

(4) The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

(5) Procedure and status of tagging of all equipment covered by extended warranties.

(6) Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.4.3. Performance Bond

1.4.3.1. The Contractor's Performance Bond will remain effective throughout the construction warranty period.

1.4.3.2. In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Government shall have

a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Government shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

1.4.3.3. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Government will have the right to recoup expenses from the bonding company.

1.4.3.4. Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.4.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Government to proceed against the Contractor as outlined in the paragraph 1.4.5.5 and/or above.

1.4.4. Pre-Warranty Conference

Prior to contract completion, or completion of any phase or portion of contract to be turned over, and at a time designated by the Contracting Officer, the Contractor shall meet with the Government to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Government for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

1.4.5. Contractor's Response to Warranty Service Requirements.

Following Government oral or written notification, which may include authorized installation maintenance personnel, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and backcharge the construction warranty payment item established.

1.4.5.1. First Priority Code 1 Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

1.4.5.2. Second Priority Code 2 Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

1.4.5.3. Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

1.4.5.4. The "Warranty Service Priority List" is as follows:

- Code 1 - Air Conditioning System

(a) Buildings with computer equipment.

(b) Barracks, mess halls (entire building down).

- Code 2 - Air Conditioning Systems

(a) Recreational support.

(b) Air conditioning leak in part of building, if causing damage.

(c) Air conditioning system not cooling properly

(d) Admin buildings with Automated Data Processing (ADP) equipment not on priority list.

- Code 1 - Doors

(a) Overhead doors not operational.

- Code 1 - Electrical

(a) Power failure (entire area or any building operational after 1600 hours).

(b) Traffic control devices.

(c) Security lights.

(d) Smoke detectors and fire alarm systems

(e) Power or lighting failure to an area, facility, portion of a facility, which may adversely impact health, safety, security, or the installation's mission requirement, or which may result in damage to property.

- Code 2 - Electrical

(a) Power failure (no power) for unoccupied buildings or portions thereof or branch circuits within occupied buildings, not listed as Code 1.

(a) Receptacle and lights, not listed as code 1.

- Code 3 - Electrical

(a) Street, parking area lights

- Code 1 - Gas

(a) Leaks and breaks.

(b) No gas to cantonment area.

- Code 1 - Heat

(a) Area power failure affecting heat.

(b) Heater in unit not working.

- Code 2 Heat

(a) All heating system failures not listed as Code 1.

- Code 3 - Interior

(a) Floor damage

(b) Paint chipping or peeling

- Code 1 - Intrusion Detection Systems - N/A.
- Code 2 - Intrusion Detection Systems other than those listed under Code 1
- Code 1 - Kitchen Equipment

(a) Dishwasher.

(b) All other equipment hampering preparation of a meal.

- Code 2 - Kitchen Equipment

(a) All other equipment not listed under Code 1.

- Code 2 - Plumbing

(a) Flush valves not operating properly

(b) Fixture drain, supply line commode, or water pipe leaking.

(c) Commode leaking at base.

- Code 3 - Plumbing

(a) Leaking faucets

- Code 1 - Refrigeration

(a) Mess Hall.

(b) Medical storage.

- Code 2 - Refrigeration

(a) Mess hall - other than walk-in refrigerators and freezers.

- Code 1 - Roof Leaks

(a) Temporary repairs will be made where major damage to property is occurring.

- Code 2 - Roof Leaks

(a) Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

- Code 1 - Sprinkler System

(a) All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinklers.

- Code 1 - Tank Wash Racks (Bird Baths)

(a) All systems which prevent tank wash.

- Code 1 - Water (Exterior)

(a) Normal operation of water pump station.

- Code 2 - Water (Exterior)

(a) No water to facility.

- Code 1 - Water, Hot (and Steam)

(a) Barracks (entire building).

- Code 2 - Water, Hot

(a) No hot water in portion of building listed under Code 1

1.4.5.5. Should parts be required to complete the work and the parts are not immediately available, the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Government, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Government will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Government will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

1.4.6. Equipment Warranty Identification Tags

1.4.6.1. Provide warranty identification tags at the time of installation and prior to substantial completion shall provide warranty identification tags on all Contractor and Government furnished equipment which the Contractor has installed.

(a) The tags shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Tag each component of contractor furnished equipment that has differing warranties on its components.

(b) Submit sample tags, representing how the other tags will look, for Government review and approval.

(c) Tags for Warrantied Equipment: The tag for this equipment shall be similar to the following: Exact format and size will be as approved.

EQUIPMENT WARRANTY - CONTRACTOR FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

CONTRACTOR NAME

CONTRACTOR WARRANTY EXPIRES

MFG WARRANTY(IES) EXPIRE

EQUIPMENT WARRANTY - GOVERNMENT FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag

1.4.6.2. Execution: Complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Submit; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems prior to final inspection and transfer of the completed facility for approval, as specified in applicable technical specification sections.

1.6. OPERATION AND MAINTENANCE MANUALS

1.6.1. General Requirements

1.6.1.1. Inasmuch as the operations and maintenance manuals are required to operate and maintain the facility, the operations and maintenance (O&M) manuals will be considered a requirement prior to substantial completion of any facility to be turned over to the Government. Beneficial occupancy of all or portions of a facility prior to substantial completion will not relieve the Contractor of liquidated damages, if substantial completion exceeds the required completion date.

1.6.1.2. Provide one permanent electronic copy on CD-ROM and 2 hard copies of the Equipment Operating, Maintenance, and Repair Manuals. Provide separate manuals for each utility system as defined hereinafter. Submit Operations and Maintenance manuals for approval before field training or 90 days before substantial completion (whichever occurs earlier). If there is no separate CLIN for O&M Manuals, the Government will withhold an amount representing $20,000, as non-progressed work, until submittal and approval of all O&M manuals are complete.

1.6.2. Definitions

1.6.2.1. Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

1.6.2.2. System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose (i.e. HVAC system is composed of many individual pieces of equipment such as fans, motors, compressors, valves, sensors, relays, etc.)

1.6.3. Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be easily substituted. Print the following identification on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

1.6.4. Warning Page

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). Place the warning page inside the front cover and in front of the title page. Include any necessary Material Safety Data Sheets (MDSD) here.

1.6.5. Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

1.6.6. Table of Contents

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

1.6.7. GENERAL

Organize manuals according to the following format, and include information for each item of equipment Submit a draft outline and table of contents for approval at 50% contract completion.

TABLE OF CONTENTS

PART I: Introduction

- Equipment Description
- Functional Description
- Installation Description

PART II: Operating Principles

PART III: Safety

PART IV: Preventive Maintenance

- Preventive Maintenance Checklist, Lubrication
- Charts and Diagrams

PART V: Spare Parts Lists

- Troubleshooting Guide
- Adjustments
- Common Repairs and Parts Replacement

PART VI: Illustrations

1.6.7.1. Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Include complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Include halftone pictures of the equipment in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Do not use copies of previously submitted shop drawings in these manuals.

1.6.7.2. Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipments, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Show performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates here, also. Marked-up catalogs or catalog pages do not satisfy this requirement. Present performance information as concisely as possible with only data pertaining to equipment actually installed. Include actual test data collected for Contractor performance here.

1.6.7.3. Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Repeat safety information as notes cautions and warnings in other sections where appropriate to operations described.

1.6.7.4. Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Include instructions for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

1.6.7.5. Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. Include the unit price for each part. List parts by major assemblies, and arrange the listing in columnar form. Include names and addresses of the nearest manufacturer's representatives, as well as any special warranty information. Provide a list of spare parts that are recommended to be kept in stock by the Government installation.

1.6.7.6. Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Include complete wiring diagrams and schematics. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

1.6.8. Framed Instructions

Post framed instructions are required for substantial completion. Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, including equipment, ductwork, piping valves, dampers, and control sequence at a location near the equipment described. Prepare condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets prior to posting. Post the framed instructions before field training.

1.6.9. (Reserved. See 1.7 for Field Training)

1.6.10. System/Equipment Requirements

1.6.10.1. Facility Heating System

Provide information on the following equipment: boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

1.6.10.2. Air-Conditioning Systems

Provide information in chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

1.6.10.3. Temperature Control and HVAC Distribution Systems

Provide all information described for the following equipment: valves, fans, air handling units, pumps, boilers, converters and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation, control air compressors, control components (sensors, controllers, adapters and actuators), and flow measuring equipment.

1.6.10.4. Central Heating Plants

Provide the information described for the following equipment: boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return waters, etc.), water softeners, and valves.

1.6.10.5. Heating Distribution Systems

Provide the information described for the following equipment: valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.), and piping systems.

1.6.10.6. Exterior Electrical Systems

Provide information on the following equipment: power transformers, relays, reclosers, breakers, and capacitor bank controls.

1.6.10.7. Interior Electrical Systems

Provide information on the following equipment: relays, motor control centers, switchgear, solid state circuit breakers, motor controller, EPS lighting systems, wiring diagrams and troubleshooting flow chart on control systems, and special grounding systems.

1.6.10.8. Energy Monitoring and Control Systems

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

1.6.10.9. Domestic Water Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

1.6.10.10. Wastewater Treatment Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentations, laboratory test equipment chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

1.6.10.11. Fire Protection Systems

Provide information on the following equipment: alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

1.6.10.12. Fire Alarm and Detection Systems

(1) The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

(2) Provide all software; database with complete identification of programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.

(3) Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.

(4) Training shall include software and programming required for the effective operation, maintenance, testing, diagnostics and expansion of the system.

1.6.10.13. Plumbing Systems

Provide information on the following equipment: water heaters, valves, pressure regulators backflow preventors, piping materials, and plumbing fixtures.

1.6.10.14. Liquid Fuels Systems

Provide information on the following equipment: tanks, automatic valves manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.

1.6.10.15. Cathodic Protection Systems

Provide information on the following material and equipment: rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

1.6.10.16. Generator Installations

Provide information on the following equipment: generator sets, automatic transfer panels, governors, exciters, regulators starting systems, switchgear, and protective devices.

1.6.10.17. Miscellaneous Systems

Provide information on the following: communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, nurse call, paging, intercom, closed circuit TV, irrigation, sound and material delivery systems, kitchen, refrigeration, disposal, ice making equipment, and other similar type special systems not otherwise specified.

1.6.10.18. Laboratory, Environmental and Pollution Control Systems

Provide information on the following equipment: wet scrubbers, quench chambers, scrub tanks, liquid oil separators, and fume hoods.

1.7. FIELD TRAINING

Field Training is a requirement for substantial completion. Conduct a training course for the operating staff for each particular system. Conduct the training is to be conducted during hours of normal working time after the system is functionally complete. The field instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. Submit a lesson plan outlining the information to be discussed during training periods. Submit this lesson plan for approval 90 days before contract completion before the field training occurs. Record training on DVD and furnish to the Government within ten (10) days following training. Document all training and furnish a list of all attendees.

1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

Promptly furnish and require any sub-contractor or supplier to furnish, in like manner, unit prices and descriptive data required by the Government for Property Record purposes of fixtures and equipment furnished and/or installed by the Contractor or sub-contractor, except prices do not need to be provided for Government-Furnished Property.

1.9. LEED REVIEW MEETINGS

1.9.1. Pre-Closeout Meeting. Approximately 30 days before submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the documentation, determine which, if any, credits will be audited and identify any corrections/missing items prior to the closeout LEED documentation submittal.

1.9.2. Approximately 14 days after submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the LEED closeout

documentation. The review conference will include discussion of and resolution of all review comments to ensure consensus on achievement of credits and satisfactory documentation. At the review conference a final score will be determined and endorsed in writing by all parties.

1.10. RED ZONE MEETING

At approximately 80% of contract completion or 60 days before the anticipated Beneficial Occupancy Date (BOD), whichever occurs first, the Contractor and the Government's project delivery team will conduct what is known as the Red Zone Meeting to discuss the close-out process, to schedule the events and review responsibilities for actions necessary to produce a timely physical, as well as fiscal, project close-out. The Red Zone meeting derives its name from the football term used to describe the team effort to move the ball the last 20 yards into the end zone. The close-out of a construction project sometimes can be equally as hard and most definitely requires the whole team's efforts. The ACO will chair the meeting. If not already provided, shortly before the meeting, the Contractor shall provide an electronic copy or access to the CADD as-built drawings, completed commensurate with the amount of work completed at the time of the Red Zone Meeting, as an indicator of the Contractors' understanding of and ability to meet the USACE CADD Standards and to ensure that the Contractor is making progress with CADD As-Built requirements. EXHIBIT 1 is a generic meeting checklist.

1.11. FINAL CLEANING

Clean the premises in accordance with FAR clause 52.236-12 and additional requirements stated here. Remove stains, foreign substances, and temporary labels from surfaces. Vacuum carpet and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean or replace filters of operating equipment if cleaning isn't possible or practicable. Remove debris from roofs, drainage systems, gutters, and downspouts. Sweep paved areas and rake clean landscaped areas. Remove waste, surplus materials, and rubbish from the site. Remove all temporary structures, barricades, project signs, fences and construction facilities. Submit a list of completed clean-up items on the day of final inspection.

1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft provided with the final design package(s) (see Section 01 33 16, paragraph 3.7.5) and submit an accounting of all installed property on Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations and cost updates from the Draft DD Form 1354. Contact the COR for any project specific information necessary to complete the DD Form 1354. This form will be a topic for the Red Zone Meeting discussed above. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site: http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form and a blank checklist (fill-able) in ADOBE (PDF) may be obtained at the following web site:
http://www.wbdg.org/ccb/DOD/UFC/ufc_1_300_08.pdf

EXHIBIT 1

SAMPLE

Red Zone Meeting Checklist

Date:_____

Contract No.	
Description / Location	
Contractor	
Contracting Officer	

Action	**Completion Milestone**	√
Inspections		
Fire		
Safety		
Pre-final		
Mechanical Test & Balance		
Commissioning		
Landscaping Complete		
Erosion Control		
Beneficial Occupancy Date (BOD)		
Furniture Installation		
Comm Installation		
As-Built Drawings		
Provide all O&M manuals, tools, shop drawings, spare parts, etc. to customer		
Training of O&M Personnel		
Provide Warranty documents to Customer		
Contract completion		

Ribbon cutting		
Payroll Clearances		
DD Form 2626 - Construction Contractor Performance Evaluation		
DD Form 2631 – A-E Performance Rated after Construction		
Status of Pending Mods and REA's/Claims		
Final Payment Completed		
Release of Claims		
Return of Unobligated Funds		
Move Project from CIP to General Ledger		
Financial completion		

End of Section 01 78 02.00 10

Appendix A

Geotechnical Information

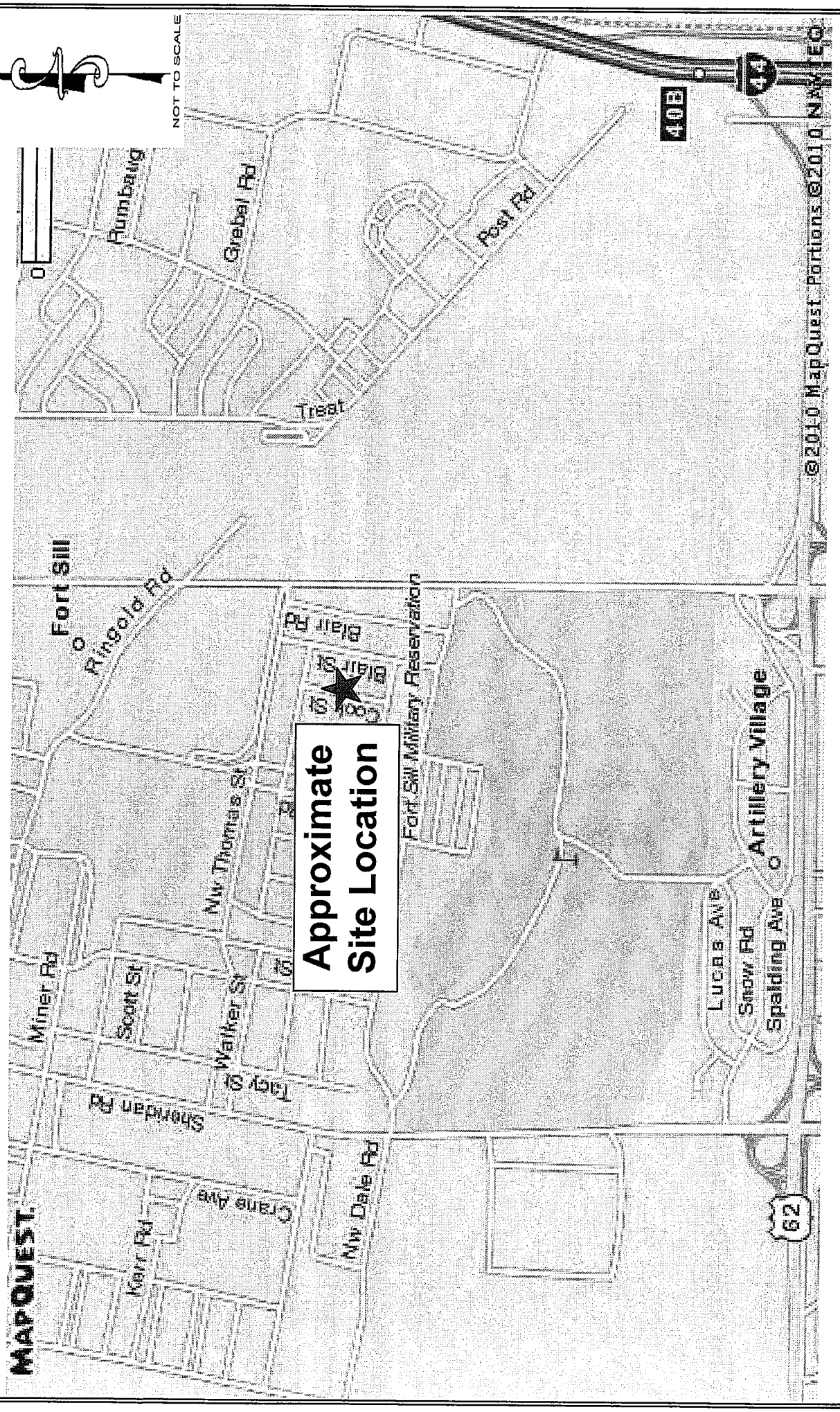
See Drawing G004 – Geotechnical Boring Locations

STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

ATTACHMENT A

Vicinity Map

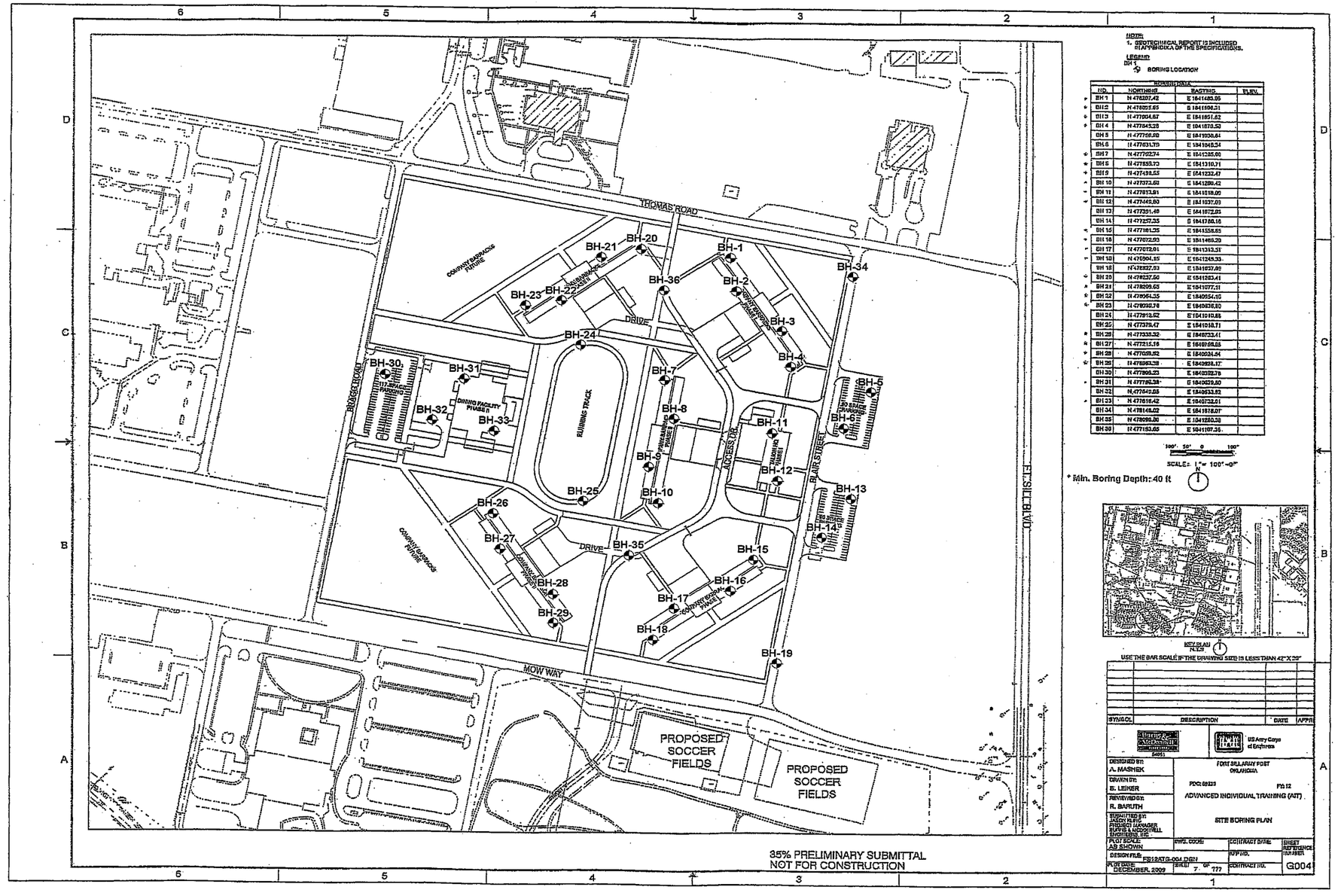
Site and Boring Location Plan



STANDARD TESTING AND ENGINEERING COMPANY

Vicinity Map

Project Name: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Project No.: 7310-3184



NOTE:
1. GEOTECHNICAL REPORT IS INCLUDED IN APPENDIX A OF THE SPECIFICATIONS.

LEGEND
BH 1 BORING LOCATION

BORING DATA

NO.	NORTHING	EASTING	ELEV.
BH 1	N 478207.42	E 1641485.05	
BH 2	N 478025.65	E 1641506.21	
BH 3	N 477904.67	E 1641651.62	
BH 4	N 477845.28	E 1641678.52	
BH 5	N 477758.80	E 1641938.64	
BH 6	N 477631.79	E 1641948.54	
BH 7	N 477702.74	E 1641285.00	
BH 8	N 477559.73	E 1641310.71	
BH 9	N 477438.55	E 1641232.47	
BH 10	N 477372.63	E 1641280.42	
BH 11	N 477813.81	E 1641618.09	
BH 12	N 477440.60	E 1641037.03	
BH 13	N 477291.48	E 1641072.93	
BH 14	N 477257.55	E 1641168.16	
BH 15	N 477181.25	E 1641558.65	
BH 16	N 477072.93	E 1641469.29	
BH 17	N 477012.61	E 1641313.51	
BH 18	N 476904.15	E 1641245.33	
BH 19	N 476837.03	E 1641037.90	
BH 20	N 478237.50	E 1641263.41	
BH 21	N 478205.63	E 1641077.11	
BH 22	N 478064.35	E 1640954.10	
BH 23	N 478038.74	E 1640836.30	
BH 24	N 477913.62	E 1641010.85	
BH 25	N 477379.47	E 1641018.71	
BH 26	N 477338.32	E 1640733.41	
BH 27	N 477215.16	E 1640708.85	
BH 28	N 477059.92	E 1640924.54	
BH 29	N 476963.38	E 1640828.17	
BH 30	N 477866.23	E 1640932.78	
BH 31	N 477786.38	E 1640829.50	
BH 32	N 477649.05	E 1640653.92	
BH 33	N 477616.42	E 1640732.61	
BH 34	N 478146.02	E 1641818.07	
BH 35	N 478098.80	E 1641250.38	
BH 36	N 477153.65	E 1641107.35	

100' 50' 0 100'
SCALE: 1" = 100'-0"
N

* Min. Boring Depth: 40 ft

KEY PLAN
N.T.S.

USE THE BAR SCALE IF THE DRAWING SIZE IS LESS THAN 42" X 30"

SYM/CL	DESCRIPTION	DATE	APPR

US Army Corps of Engineers

DESIGNED BY: A. MASHEK
DRAWN BY: B. LEIKER
REVIEWED BY: R. BARLTH
SUBMITTED BY: JASON R. FIC, PROJECT MANAGER, STEVEN L. MCCORTELL, SUPERVISOR, STC

FORT SILL ARMY POST
OKLAHOMA
PDC: 09323 FD 12
ADVANCED INDIVIDUAL TRAINING (AIT)
SITE BORING PLAN

PLOT SCALE: AS SHOWN
DWG. CODE:
CONTRACT DATE:
SHEET REFERENCE NUMBER: G004
DESIGN FILE: F312ATG-004.DGN
APP NO.
PLOT DATE: DECEMBER, 2009
SHEET 7 OF 277
CONTRACT NO.

STANDARD TESTING AND ENGINEERING COMPANY

Scale refers to the full size drawing

Project: Ft. Sill AIT Barracks
Location: Lawton, Oklahoma
Project No.: 7310-3184

SITE AND BORING LOCATION PLAN

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

ATTACHMENT B

Boring Logs

Key to Symbols

Definition of Descriptive Terms

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

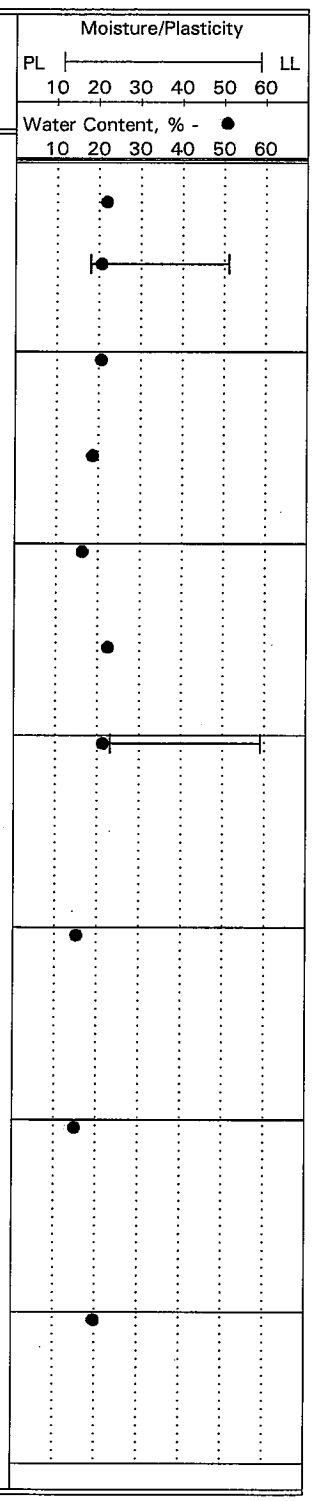
SOIL BORING LOG

Boring No. BH-1

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/15/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan, P.E.
Water Depth: 24.3 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				5.5" ASPHALT		
				5" AGGREGATE		
			2/6" 5/6" 7/6"	Dk. Gray FAT CLAY Moist, High Plasticity, Stiff LL=51, PI=33	105	
5			3/6" 5/6" 6/6"	Brn.		
10			4/6" 8/6" 11/6"	V. Stiff		
			4/6" 7/6" 9/6"			
15			3/6" 7/6" 8/6"	LL=59, PI=36	111	
20			4/6" 8/6" 11/6"	Sl. Moist,V. Stiff		
25			7/6" 18/6" 8/6"	Brn. & Gray		
30			11/6" 16/6" 22/6"	Reddish Brn. & Lt. Gray SHALE Sl. Moist, High Plasticity, V. Stiff		



Page: 1 of 2 for boring BH-1

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-1 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 4/15/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			12/6" 17/6" 22/6"				
40			9/6" 12/6" 16/6"	Gray			
45			8/6" 12/6" 16/6"				
50			15/6" 23/6" 31/6"	LL=68, PI=29			
55							
60							
65							

Page: 2 of 2 for boring BH-1

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

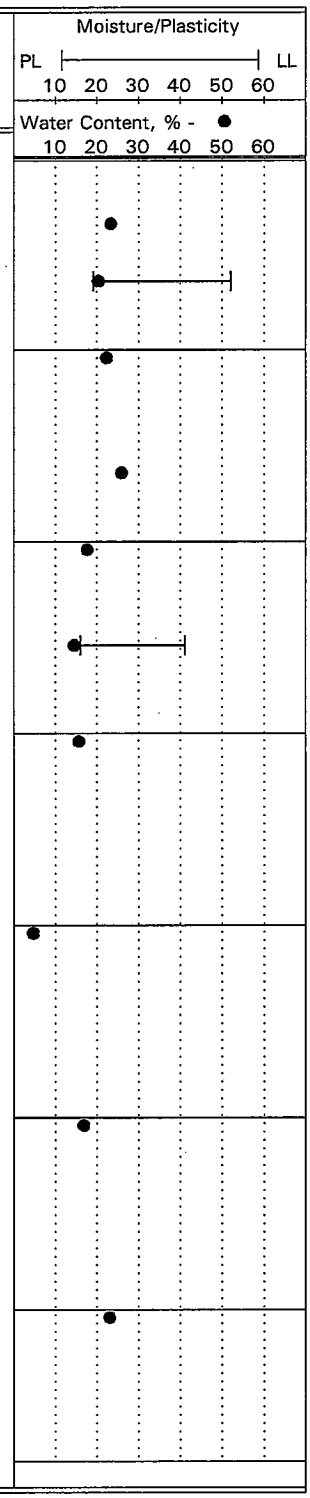
SOIL BORING LOG

Boring No. BH-2

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/14/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				8" ASPHALT 9" AGGRAGETE		
			2/6" 5/6" 7/6"	Dk. Gray FAT CLAY Moist, High Plasticity, Stiff Grayish Brn. & Brn. LL=52, PI=33	100	
5			2/6" 5/6" 8/6"	Brn.		
			4/6" 6/6" 10/6"	w/ Gravel, V. Stiff		
10			4/6" 6/6" 9/6"	Brn. CLAY WITH SAND Moist, Fl. High Plasticity, Stiff LL=41, PI=25		
15			7/6" 7/6" 11/6"	Brn. SANDY CLAY Moist, Med. Plasticity, V. Stiff		
20			10/6" 14/6" 20/6"	Brn. GRAVEL WITH SILT & SAND Moist, Nonplastic, Dense USCS: GW-GM; AASHTO: A-1-a		9.1
25				Brn. SILTY SAND Wet, Nonplastic, Dense		
30			11/6" 13/6" 18/6"	Gray & Reddish Brn. SHALE Moist, Fl. High Plasticity, V. Stiff		



Page: 1 of 2 for boring BH-2

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-2 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 4/14/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			13/6" 16/6" 23/6"	LL=50, PI=27	103		
40			8/6" 12/6" 16/6"	Gray			
45							
50							
55							
60							
65							

Page: 2 of 2 for boring BH-2

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

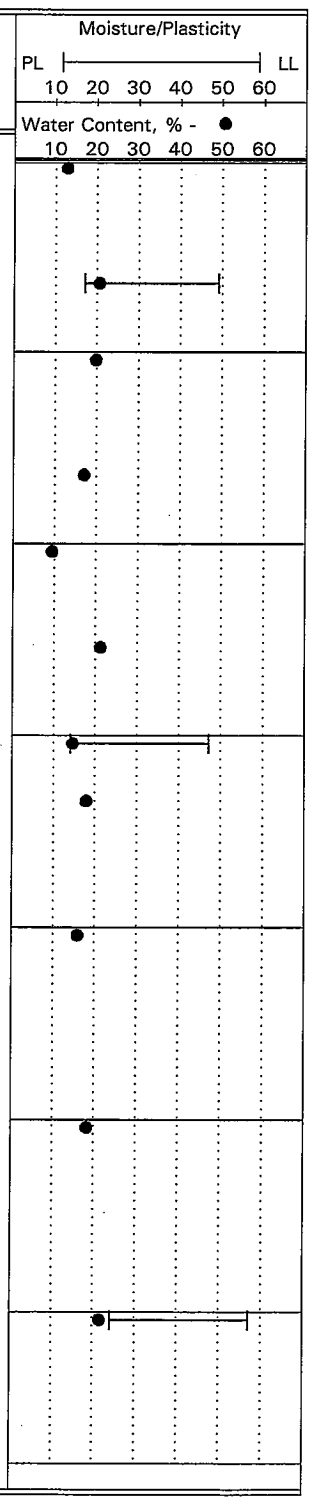
SOIL BORING LOG

Boring No. BH-3

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/13/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. CLAY Sl. Moist, Med. Plasticity		
				Brn., Moist, High Plasticity LL=49, PI=32	105	
5						
10				Sl. Moist		
				Moist		
15				LL=47, PI=33	106	
			6/6" 8/6" 13/6"	w/ Seams of Gravel Sl. Moist, Fl. High Plasticity, V. Stiff		
20			6/6" 11/6" 16/6"			
25			5/6" 8/6" 9/6"	Brn. & Lt. Gray., w/ Seams of Sandy Clay		
30			8/6" 13/6" 19/6"	Gray & Reddish Brn. SHALE Sl. Moist, High Plasticity, V. Stiff LL=57, PI=33		



Page: 1 of 2 for boring BH-3

STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-3 continued

Project: Ft. Sill AIT Barracks Project No.: 7310-3184

Project Location: Lawton, Oklahoma Date Drilled.: 4/13/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60
35			10/6" 17/6" 23/6"				
40			10/6" 16/6" 22/6"				
45							
50							
55							
60							
65							

Page: 2 of 2 for boring BH-3

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

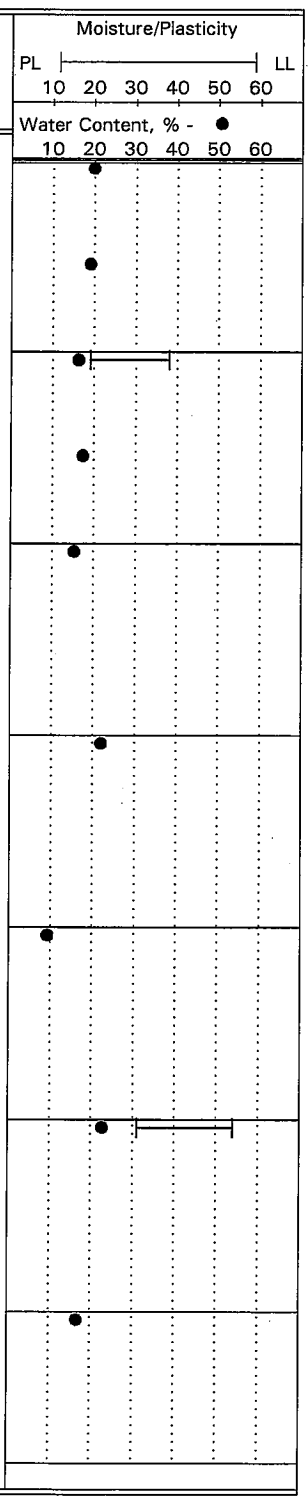
SOIL BORING LOG

Boring No. BH-4

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/16/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			3/6" 3/6" 5/6"	Dk. Brn. & Brn. CLAY Moist, Med. Plasticity, Firm		
				Brn.	106	
5			7/6" 11/6" 13/6"	Sl. Moist, V. Stiff USCS: CL; AASHTO: A-6(17) LL=38, PI=19		90.1
				Unconfined Compression Test: qu=5.1 tsf @ 3.2% strain (7.5 to 9 ft.)	115	
10			3/6" 5/6" 8/6"	Stiff		
15			2/6" 4/6" 6/6"	Gray, Moist		
20			8/6" 12/6" 13/6"	Brn. SILTY SAND WITH GRAVEL V. Moist, Nonplastic, Med. Dense		
				Reddish Brn. CLAY Sl. Moist, Med. Plasticity, V. Stiff		
25			6/6" 12/6" 18/6"	Gray & Reddish Brn. SHALE Sl. Moist, Med. Plasticity, V. Stiff LL=54, PI=23	104	
30			8/6" 14/6" 18/6"			



Page: 1 of 2 for boring BH-4

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-4 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/16/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			12/6" 16/6" 27/6"				
40			18/6" 28/6" 37/6"	Gray, Fl. High Plasticity			
45			15/6" 19/6" 29/6"				
50			18/6" 26/6" 37/6"	LL=60, PI=25			
55							
60							
65							

Page: 2 of 2 for boring BH-4

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-5

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/30/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
0				1" ASPHALT 3" AGGRAGATE Dk. Gray CLAY Moist, Med. Plasticity			
5				Brn. FAT CLAY Moist, High Plasticity LL=52, PI=33			
10				Brn. CLAY Moist, Fl. High Plasticity w/ Seams of Sand			
15				LL=41, PI=25			
20							
25							
30							

Page: 1 of 1 for boring BH-5

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

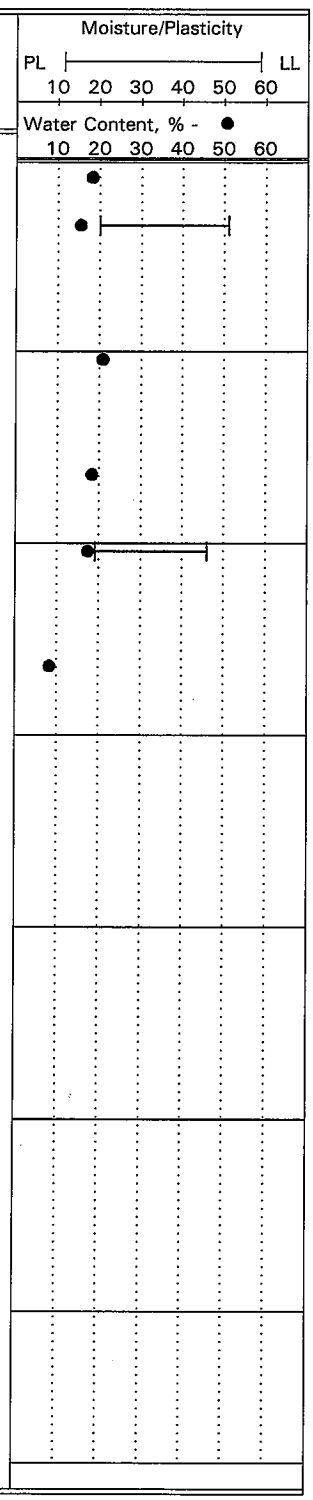
SOIL BORING LOG

Boring No. BH-6

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/30/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				1" ASPHALT		
				3" AGGRAGETE		
				Dk. Gray FAT CLAY Moist, High Plasticity Sl. Moist LL=51, PI=31		
5				Brn., Moist		
				Brn. CLAY Moist, Fl. High Plasticity		
10				LL=46, PI=27		
				w/ Seams of Sand		
15				Brn. CLAY Moist, Fl. High Plasticity		
20						
25						
30						



Page: 1 of 1 for boring BH-6

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

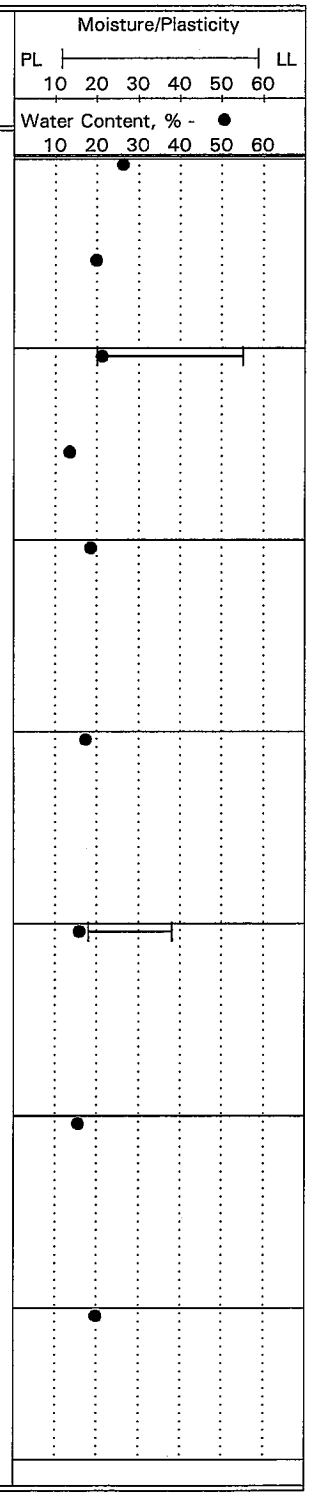
SOIL BORING LOG

Boring No. BH-7

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/25/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 22 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			1/6" 3/6" 4/6"	Dk. Brn. CLAY Moist, Med. Plasticity, Firm		
				Brn. FAT CLAY Moist, High Plasticity, Stiff		
5			3/6" 4/6" 7/6"	LL=55, PI=35	103	
				Sl. Moist		
10			2/6" 5/6" 10/6"	Reddish Brn. CLAY Moist, Fl. High Plasticity, Stiff		
15			4/6" 8/6" 13/6"	V. Stiff		
20			4/6" 8/6" 10/6"	Reddish Brn. CLAY WITH SAND Sl. Moist, Med. Plasticity, V. Stiff LL=38, PI=20	111	
25			8/6" 13/6" 15/6"	Brn. CLAYEY SAND w/ Gravel Wet, Med. Plasticity, Med. Dense		
30			7/6" 13/6" 22/6"	Reddish Brn., Olive Brn. & Gray SHALE Moist, Med. Plasticity, V. Stiff		



Page: 1 of 2 for boring BH-7

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-7 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 3/25/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity
35			11/6" 21/6" 25/6"	Olive Brn. & Gray			
40			18/6" 25/6" 38/6"	LL=43, PI=22			
45							
50							
55							
60							
65							

Moisture/Plasticity: PL — LL; 10 20 30 40 50 60; Water Content, % - ●

Page: 2 of 2 for boring BH-7

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-8

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/24/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL – LL; Water Content, %)
0			2/6" 3/6" 2/6"	Dk. Brn. CLAY Moist, Med. Plasticity, Firm LL=43, PI=22			
				Brn. FAT CLAY Moist, High Plasticity, Stiff			
5			2/6" 5/6" 6/6"				
			5/6" 8/6" 11/6"	V. Stiff			
10			4/6" 6/6" 7/6"	Reddish Brn. CLAY Moist, Fl. High Plasticity, Stiff			
				w/ Seams of Sand			
15			3/6" 7/6" 11/6"	Reddish Brn. SANDY CLAY Sl. Moist, Fl. High Plasticity, V. Stiff LL=42, PI=24			
20			8/6" 10/6" 14/6"	Brn.			
25			4/6" 7/6" 11/6"	Brn., Reddish Brn. & Gray SHALE V. Moist, Med. Plasticity, V. Stiff			
30			7/6" 12/6" 34/6"	Olive Brn., Reddish Brn. & Gray			

Moisture/Plasticity: PL – LL; 10 20 30 40 50 60
Water Content, % - ●: 10 20 30 40 50 60

Page: 1 of 2 for boring BH-8

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

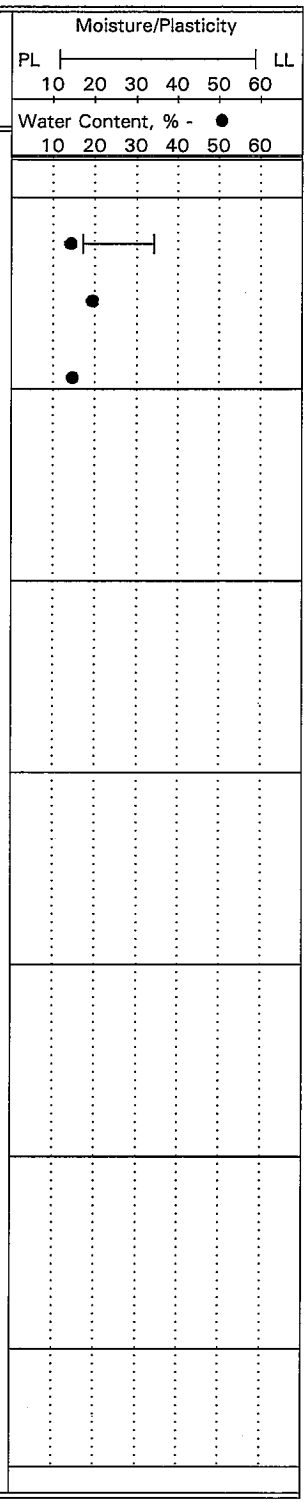
Boring No. BH-8 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/24/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
35			29/6" 41/6" 50/5"	(ROCK) Reddish Brn. SHALE Sl. Moist, Med. Plasticity, Soft LL=34, PI=17 Unconfined Compression Test: qu=0.96 tsf @ 2.6% strain (37.5-38 ft.)	104	
40				Unconfined Compression Test: qu=0.59 tsf @ 1.4% strain (39.5-40 ft.) RQD=73% (36.5 to 41.5 ft.)	110	
45						
50						
55						
60						
65						

Moisture/Plasticity



Page: 2 of 2 for boring BH-8

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

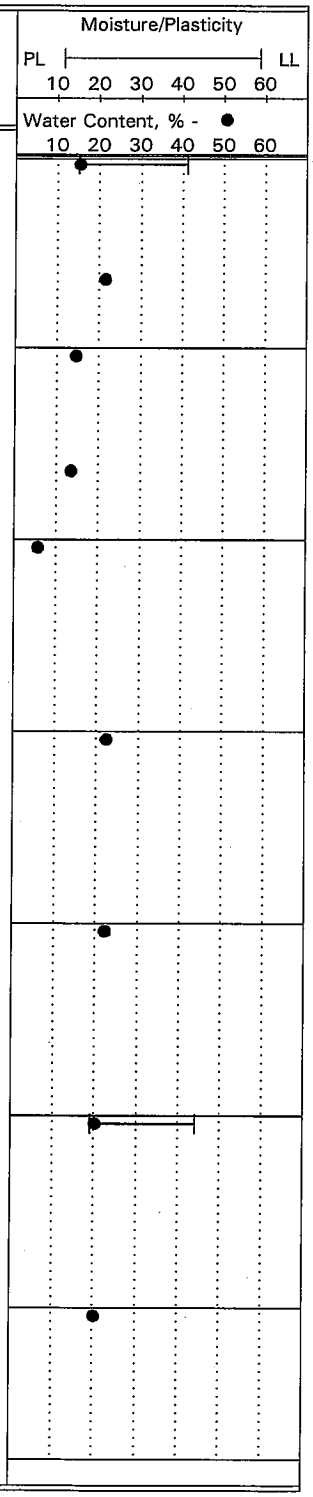
SOIL BORING LOG

Boring No. BH-9

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/13/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. CLAY Moist, Fl. High Plasticity LL=41, PI=26		
				Brn. FAT CLAY Moist, High Plasticity		
5					111	
				w/ Seams of Sand		
10				Brn. CLAY Sl. Moist, Fl. High Plasticity, Stiff		
			2/6" 6/6" 8/6"			
15			3/6" 7/6" 8/6"	Moist		
20			5/6" 7/6" 10/6"	Brn. & Lt. Gray, V. Stiff		
25			6/6" 10/6" 14/6"	Lt. Gray, Lt. Brn. & Reddish Brn. LL=49, PI=25	103	
30			9/6" 16/6" 22/6"	Gray & Reddish Brn. SHALE Sl. Moist, Fl. High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-9 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 4/13/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			12/6" 19/6" 22/6"				
40			11/6" 17/6" 25/6"	Gray LL=55, PI=27			
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

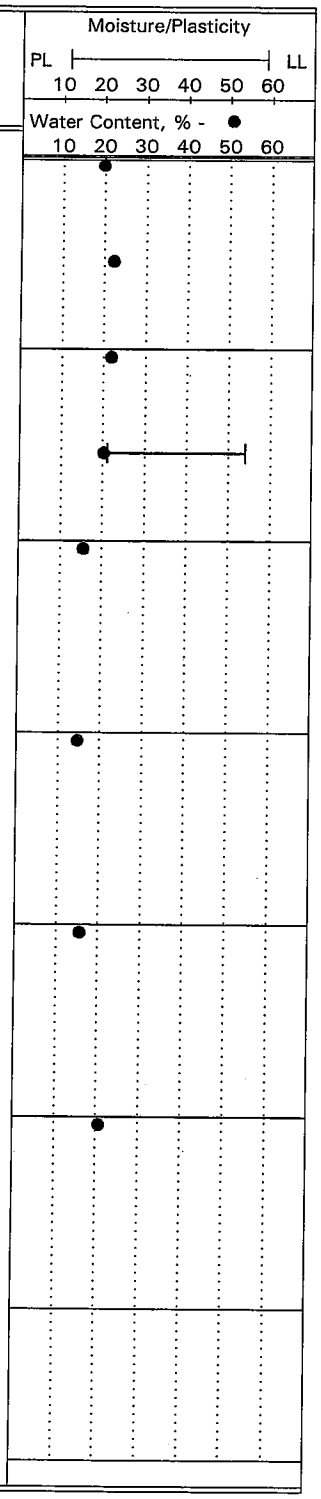
SOIL BORING LOG

Boring No. BH-10

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/24/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24.5 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 3/6" 4/6"	Dk. Brn. & Brn. CLAY Moist, Fl. High Plasticity, Firm		
				Brn. FAT CLAY Moist, High Plasticity, Stiff		
5			2/6" 6/6" 8/6"	Reddish Brn.		
				Reddish Brn. FAT CLAY WITH SAND Moist, High Plasticity, Stiff USCS: CH; AASHTO: A-7-6(27) LL=54, PI=33	102	79.7
10			3/6" 5/6" 8/6"	Brn. SANDY CLAY Sl. Moist, Fl. Low Plasticity, Stiff		
15			4/6" 8/6" 8/6"	V. Stiff		
20			5/6" 7/6" 10/6"	Reddish Brn., Low Plasticity, V. Stiff		
25			7/6" 9/6" 16/6"	Brn. SILTY SAND Wet, Tr. Plasticity, Med. Dense		
30						



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-10 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/24/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			14/6" 19/6" 23/6"	Dense			
40			13/6" 14/6" 17/6"	Gray & Reddish Brn. SHALE Moist, Med. Plasticity, V. Stiff LL=45, PI=18			
45			10/6" 16/6" 18/6"				
50			9/6" 15/6" 16/6"				
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

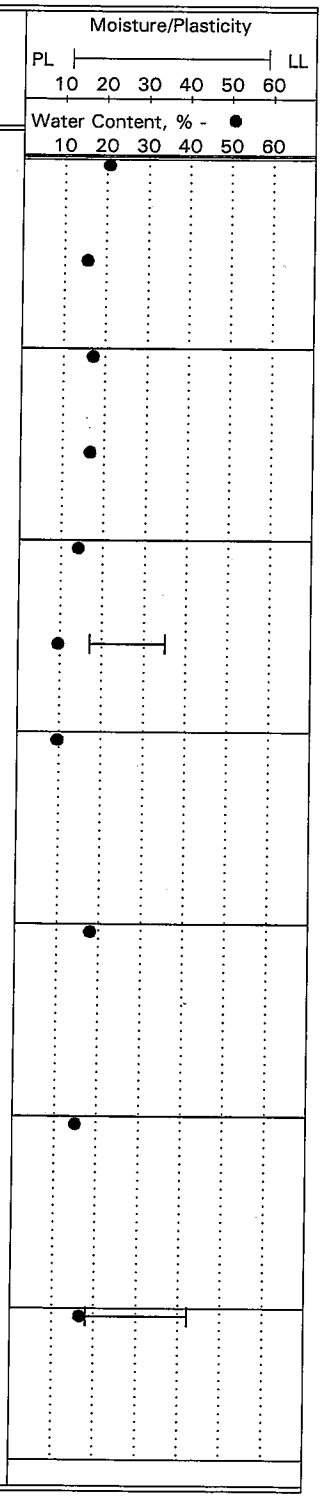
SOIL BORING LOG

Boring No. BH-11

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/23/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24.5 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 2/6" 3/6"	Dk. Brn. CLAY Moist, Fl. Low Plasticity, Firm		
				Brn. FAT CLAY Sl. Moist, High Plasticity, V. Stiff		
5			5/6" 10/6" 13/6"			
			4/6" 8/6" 12/6"			
10			2/6" 6/6" 7/6"	Brn. SANDY CLAY Sl. Moist, Med. Plasticity, Stiff		
				LL=35, PI=18		
15			5/6" 12/6" 9/6"	V. Stiff, w/ Seams of Sand		
20			2/6" 7/6" 8/6"	Reddish Brn., Stiff		
25			5/6" 23/6" 16/6"	Brn., V. Stiff		
30			11/6" 27/6" 20/6"	Olive Brn., Gray & Reddish Brn. SHALE Moist, Fl. High Plasticity, V. Stiff LL=42, PI=24		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-11 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/23/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			8/6" 18/6" 27/6"				
40			7/6" 11/6" 15/6"	Reddish Brn. & Gray			
45			12/6" 17/6" 20/6"	Gray, Sl. Moist, High Plasticity			
50			22/6" 29/6" 34/6"	LL=62, PI=29	93		
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

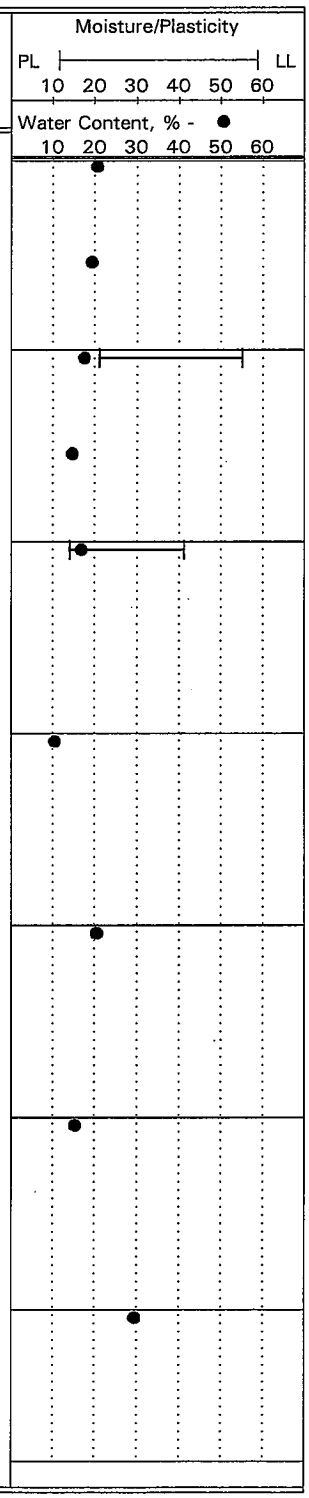
SOIL BORING LOG

Boring No. BH-12

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/22/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 30 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 3/6" 4/6"	Dk. Brn CLAY Moist, Fl. Low Plasticity, Firm		
				Brn. FAT CLAY Sl. Moist, High Plasticity, V. Stiff		
5			4/6" 8/6" 13/6"	LL=55, PI=34	111	
				w/ Seams of Sand		
10			3/6" 7/6" 9/6"	Reddish Brn. CLAY Moist, Fl. High Plasticity, V. Stiff LL=41, PI=27		
15			3/6" 8/6" 12/6"	Brn. SILTY SAND WITH GRAVEL V. Moist, Nonplastic, Med. Dense		
20			4/6" 8/6" 11/6"	Reddish Brn. & Gray CLAY V. Moist, Fl. High Plasticity, V. Stiff		
25			7/6" 18/6" 11/6"	Brn. & Gray, Moist, w/ Seams of Sand		
30			8/6" 13/6" 16/6"	Olive Brn. & Gray SHALE Sl. Moist, High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-12 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/22/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			50/1.9"	(ROCK) Gray SHALE w/ Interbedded Sandstone Sl. Moist, High Plasticity, Soft			
40				Unconfined Compression Test: qu=4.1 tsf @ 6.0% strain (39.5 to 40 ft.) Unconfined Compression Test: qu=2.9 tsf @ 9.8% strain (40.0 to 40.5 ft.) RQD=38% (35.5 to 40.5 ft.)	119 120		
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-13

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/25/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL – LL; Water Content, %)
0				1" ASPHALT 4" AGGREGATE Dk. Gray CLAY Moist, Med. Plasticity LL=33, PI=19			
5				Brn. FAT CLAY Moist, High Plasticity			
10				Brn. SANDY CLAY Sl. Moist, Med. Plasticity			
15				Brn. FAT CLAY Moist, High Plasticity LL=61, PI=39			
20							
25							
30							

Moisture/Plasticity: PL – LL; 10 20 30 40 50 60
Water Content, % - ●: 10 20 30 40 50 60

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

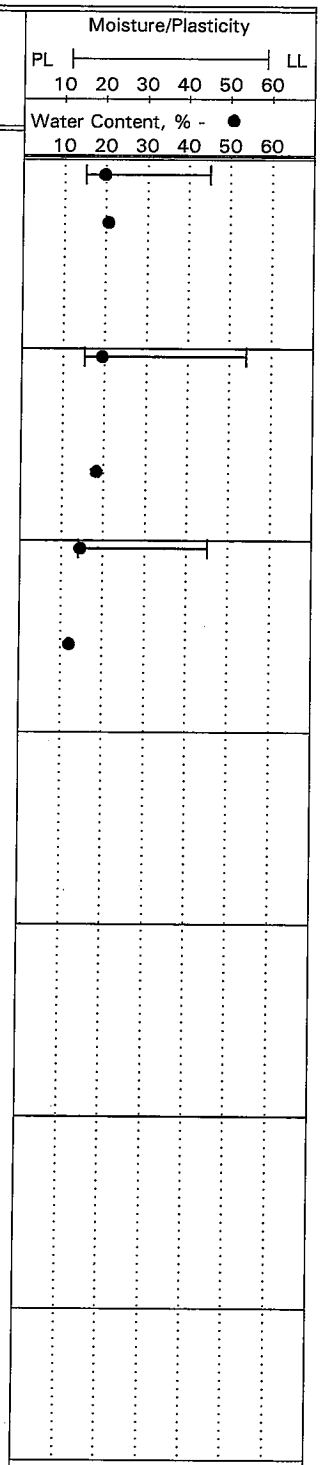
SOIL BORING LOG

Boring No. BH-14

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/25/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				1" ASPHALT 3" AGGREGATE Dk. Brn. CLAY Moist, High Plasticity LL=45, PI=30 Brn. Unconfined Compression Test: qu=2.3 tsf @ 7.6% strain (1.5 to 3.5 ft.)	105	
5				Brn. FAT CLAY WITH SAND Moist, High Plasticity LL=54, PI=39		
10				Brn. CLAY WITH SAND Moist, High Plasticity LL=45, PI=31		
15				Brn. SANDY CLAY Moist, Med. Plasticity		
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

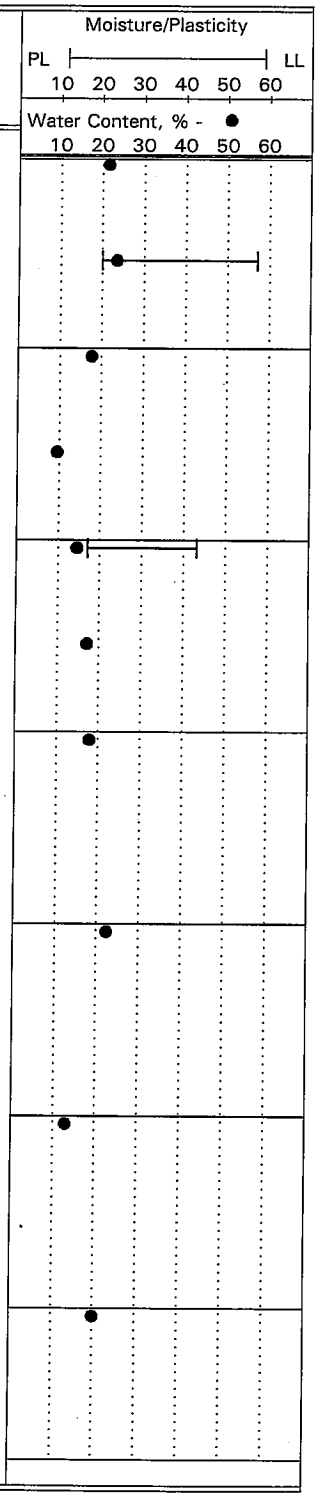
SOIL BORING LOG

Boring No. BH-15

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA (0 to 36 ft.)
Surface Elevation:
Remarks: Rock core (36 to 41 ft.) w/ mud rotary

Project No.: 7310-3184
Date Drilled.: 3/19/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			1/6" 2/6" 3/6"	Dk. Brn. & Brn. CLAY Sl. Moist, Med. Plasticity		
				Brn. FAT CLAY V. Moist, High Plasticity, Firm LL=57, PI=37		
5			5/6" 6/6" 11/6"	Brn. FAT CLAY WITH SAND Sl. Moist, High Plasticity, V. Stiff		
			5/6" 8/6" 11/6"			
10			6/6" 8/6" 10/6"	Brn. & Gray SANDY CLAY Sl. Moist, Fl. High Plasticity, V. Stiff USCS: CL; AASHTO: A-7-6(11) LL=43, PI=26	114	55.8
15			6/6" 8/6" 8/6"	w/ Gravel, Med. Plasticity		
20			5/6" 6/6" 9/6"	Brn. CLAY Moist, Med. Plasticity, Stiff		
25			6/6" 19/6" 16/6"	Brn., w/ Seams of Sand & Gravel Sl. Moist, V. Stiff		
30				Brn. SILTY SAND (Medium Grain) Wet, Nonplastic (SPT couldn't be performed)		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-15 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/19/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			17/6" 50/4.1"	(ROCK) Brn. & Reddish Brn. SHALE Sl. Moist, Fl. High Plasticity, Soft Unconfined Compression Test: qu=17.4 tsf @ 2.4% strain (36.5 to 37 ft.)	132		
40				Unconfined Compression Test: qu=12.2 tsf @ 2.5% strain (39 to 39.5 ft.) RQD=70% (36 to 41 ft.)	130		
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-16

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/31/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 23.5 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
0			2/6" 3/6" 3/6"	Dk. Brn. CLAY Moist, Fl. Low Plasticity, Firm			
				Brn. FAT CLAY Moist, High Plasticity, Stiff			
5			2/6" 4/6" 6/6"	LL=55, PI=35	104		
				Brn. FAT CLAY WITH SAND Sl. Moist, High Plasticity, Stiff			
10			2/6" 5/6" 8/6"				
15			3/6" 6/6" 9/6"	Brn. FAT CLAY Moist, High Plasticity, Stiff LL=73, PI=52			73
20			4/6" 9/6" 10/6"	w/ Gravel, Sl. Moist, V. Stiff			
25			9/6" 12/6" 12/6"	Brn. SILTY SAND WITH GRAVEL Wet, Tr. Plasticity, Med. Dense			
30			7/6" 11/6" 16/6"	Gray & Reddish Brn. SHALE Sl. Moist, High Plasticity, V. Stiff			

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-16 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 3/31/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			8/6" 12/6" 14/6"	Gray	98		
40			9/6" 14/6" 16/6"				
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

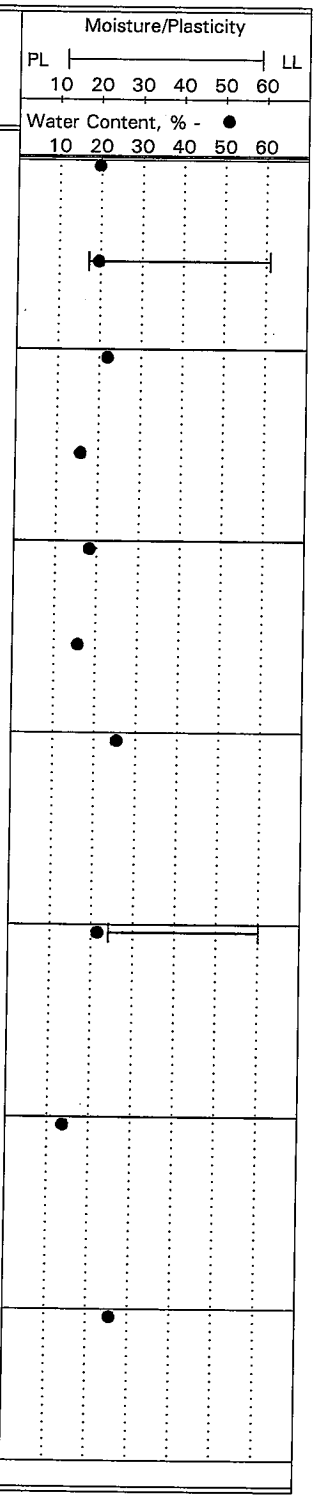
SOIL BORING LOG

Boring No. BH-17

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/31/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 23.5 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Gray CLAY Moist, Med. Plasticity		
				Brn. FAT CLAY WITH SAND Moist, High Plasticity LL=61, PI=44	104	
5				Unconfined Compression Test: qu=1.3 tsf @ 5.9% strain (5.0 to 7.5 ft.)	103	
10						
15			3/6" 5/6" 8/6"	Brn. & Olive Brn., Stiff		
20			4/6" 8/6" 12/6"	Olive Brn., Sl. Moist, V. Stiff LL=60, PI=36		
25			13/6" 24/6" 24/6"	Brn. SILTY SAND WITH GRAVEL Wet, Nonplastic, Dense		
30			8/6" 12/6" 19/6"	Gray & Reddish Brn. SHALE Moist, High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-17 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/31/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity
35			7/6" 11/6" 17/6"	Gray, Sl. Moist			
40			9/6" 13/6" 16/6"	Moist LL=63, PI=39			
45							
50							
55							
60							
65							

Moisture/Plasticity: PL — LL; 10 20 30 40 50 60; Water Content, % - ●; 10 20 30 40 50 60

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

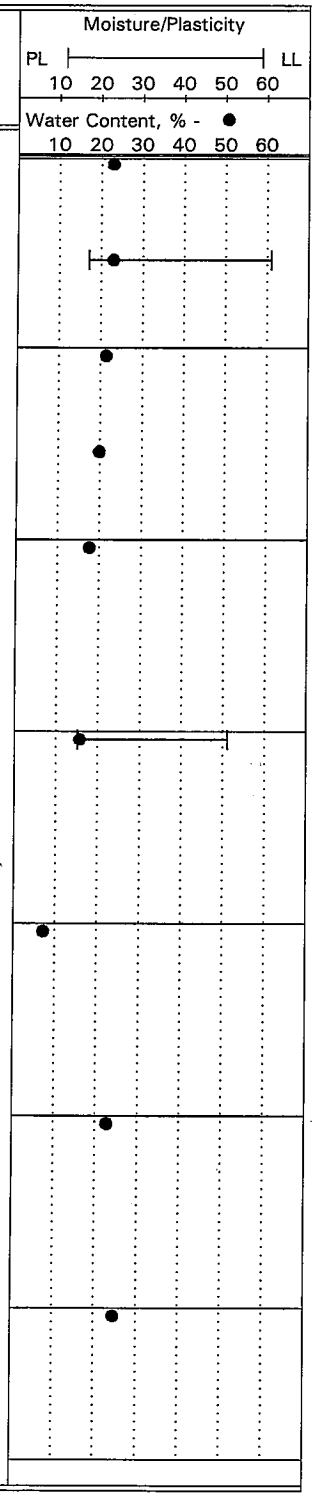
SOIL BORING LOG

Boring No. BH-18

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/30/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 22 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 3/6" 4/6"	Dk. Brn. & Brn. CLAY Moist, Med. Plasticity, Firm		
				Brn. FAT CLAY Moist, High Plasticity, Firm LL=61, PI=44	102	
5			3/6" 4/6" 6/6"	Brn. FAT CLAY WITH SAND Moist, High Plasticity, Stiff		
				Brn. SANDY FAT CLAY Moist, High Plasticity, V. Stiff		
10			4/6" 8/6" 9/6"			
15			5/6" 10/6" 10/6"	Brn. FAT CLAY WITH SAND Moist, High Plasticity, V. Stiff LL=51, PI=36	111	
20			10/6" 13/6" 11/6"	Brn. SILTY SAND WITH GRAVEL V. Moist, Nonplastic, Med. Dense		
25			3/6" 5/6" 8/6"	Wet		
30			7/6" 14/6" 18/6"	Gray SHALE Moist, High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-18 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/30/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			6/6" 10/6" 13/6"				
40			10/6" 14/6" 18/6"				
45			8/6" 14/6" 18/6"	Gray & Reddish Brn.			
50			10/6" 21/6" 20/6"	LL=56, PI=32			
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

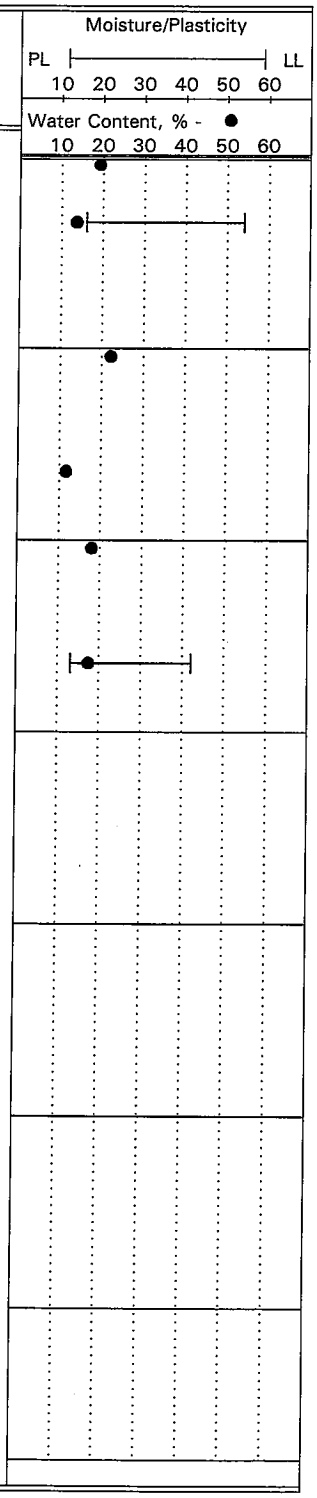
SOIL BORING LOG

Boring No. BH-19

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/23/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. & Brn. FAT CLAY Sl. Moist, High Plasticity Brn. LL=54, PI=38		
5				Brn. FAT CLAY WITH SAND Moist, High Plasticity		
				Brn. SANDY CLAY Sl. Moist, Fl. Low Plasticity		
10				Brn. CLAY WITH SAND Moist, Med. Plasticity		
				Brn. SANDY CLAY Moist, High Plasticity USCS: CL; AASHTO: A-7-6(11) LL=42, PI=29 Unconfined Compression Test: qu=2.2 tsf @ 4.5% strain (13 to 15 ft.)	111	54.2
15				Brn. CLAY WITH SAND Moist, Med. Plasticity		
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

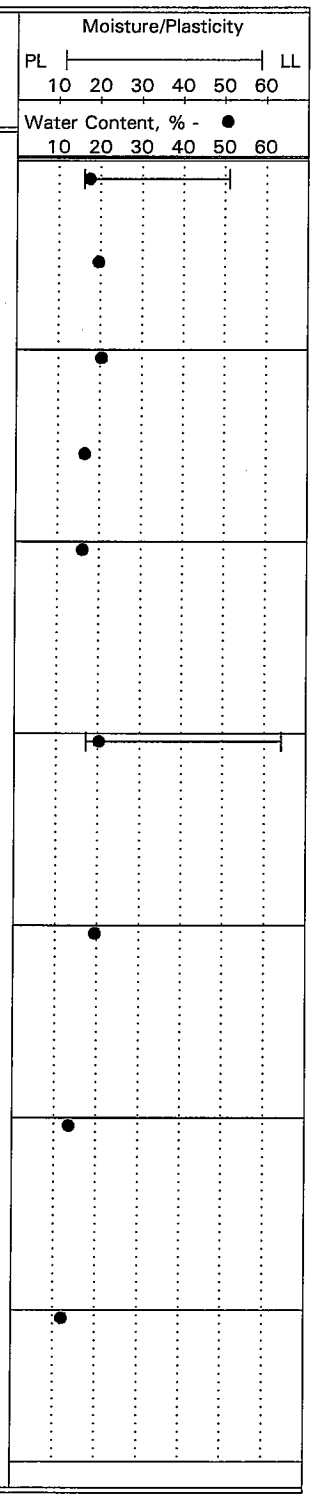
SOIL BORING LOG

Boring No. BH-20

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/20/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24.5 @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			3/6" 3/6" 5/6"	4" ASPHALT Dk. Gray FAT CLAY Moist, High Plasticity, Firm LL=51, PI=35 Brn.	103	
5			2/6" 5/6" 7/6" 3/6" 6/6" 9/6"	Brn. FAT CLAY WITH SAND Sl. Moist, High Plasticity, Stiff		
10						
15			3/6" 5/6" 9/6"	Brn. FAT CLAY Moist, High Plasticity, Stiff LL=64, PI=47		
20			4/6" 7/6" 10/6"	Brn. & Gray, V. Stiff		
25			12/6" 8/6" 8/6"	Brn. & Gray SANDY CLAY w/ Gravel Sl. Moist, Med. Plasticity, V. Stiff		
30			13/6" 23/6" 38/6"	Reddish Brn. SHALE Moist, Fl. Low Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-20 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 4/20/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			13/6" 17/6" 24/6"	Olive Brn. & Gray, Med. Plasticity LL=28, PI=16	117		
40			9/6" 13/6" 19/6"	Gray, Med. Plasticity			
45			14/6" 19/6" 22/6"				
50			10/6" 14/6" 18/6"				
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

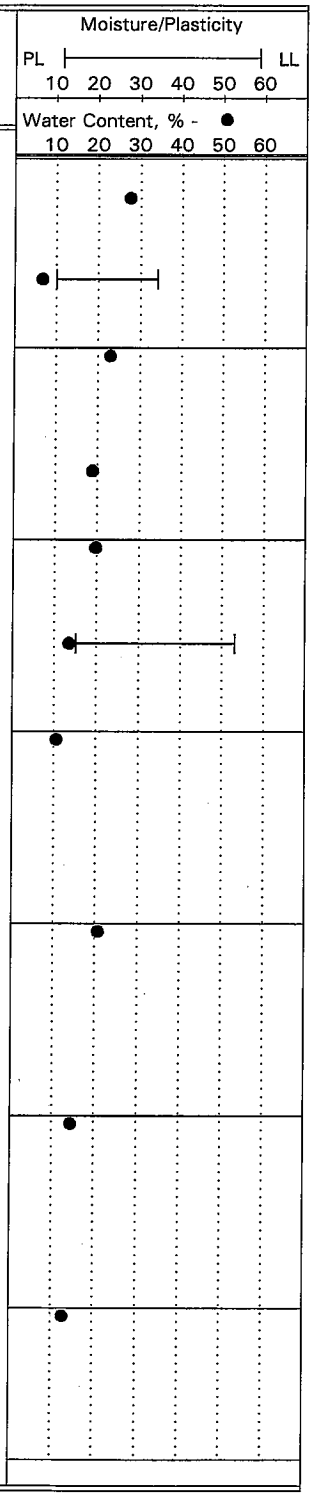
SOIL BORING LOG

Boring No. BH-21

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/15/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				2.5" ASPHALT		
				8" AGGREGATE		
			2/6" 2/6" 3/6"	Dk. Gray CLAY V. Moist, Fl. High Plasticity, Firm Sl. Moist LL=34, PI=24	115	
5			2/6" 4/6" 6/6"	Brn. FAT CLAY Moist, High Plasticity, Stiff		
			3/6" 5/6" 8/6"			
10			3/6" 5/6" 7/6"			
				Brn. SANDY FAT CLAY Moist, High Plasticity, Stiff LL=53, PI=38		
15			4/6" 7/6" 10/6"	Brn. SILTY SAND WITH GRAVEL V. Moist, Nonplastic, Med. Dense		
20			4/6" 7/6" 9/6"	Brn. FAT CLAY Sl. Moist, High Plasticity, V. Stiff		
25			5/6" 10/6" 14/6"	Brn. & Lt. Gray		
30			4/6" 16/6" 26/6"	Reddish Brn., Olive Brn. & Gray SHALE Sl. Moist, Med. Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-21 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 4/15/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			24/6" 50/5.1"	(ROCK) Olive Brn. & Gray, SHALE Sl. Moist, Med. Plasticity, Soft LL=34, PI=21 Unconfined Compression Test: qu=20.6 tsf @ 3.6% strain (36 to 36.5 ft.) Unconfined Compression Test: qu=3.6 tsf @ 1.9% strain (36.5 to 37 ft.)	129 115		
40				Unconfined Compression Test: qu=1.2 tsf @ 1.8% strain (40 to 40.5 ft.) RQD=95% (36 to 41 ft.)	111		
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

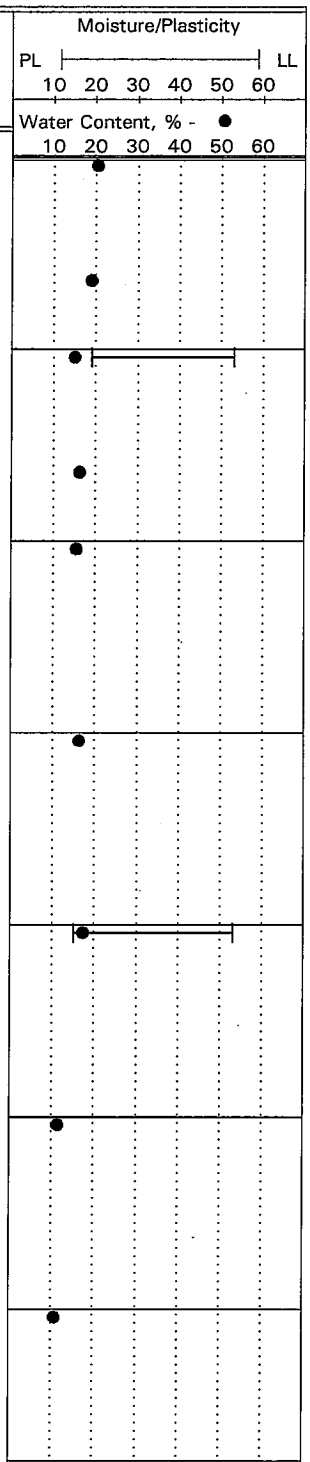
SOIL BORING LOG

Boring No. BH-22

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/14/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 24 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. CLAY Moist, Med. Plasticity		
5				Brn. FAT CLAY Sl. Moist, High Plasticity LL=53, PI=34	102	
10				Brn. CLAY WITH SAND Sl. Moist, Med. Plasticity		
			4/6" 5/6" 7/6"	Brn. SANDY CLAY Sl. Moist, Fl. Low Plasticity, Stiff		
15			6/6" 7/6" 8/6"	Brn. FAT CLAY w/ Gravel Moist, High Plasticity, Stiff		
20			4/6" 10/6" 18/6"	Brn. & Lt. Brn., V. Stiff LL=53, PI=38	108	
25			9/6" 10/6" 10/6"	Brn. CLAYEY SAND w/ Gravel V. Moist, Low Plasticity, Med. Dense		48.4
30			9/6" 16/6" 20/6"	Gray SHALE Sl. Moist, High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-22 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 4/14/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			8/6" 11/6" 13/6"				
40			13/6" 17/6" 23/6"	LL=60, PI=29			
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

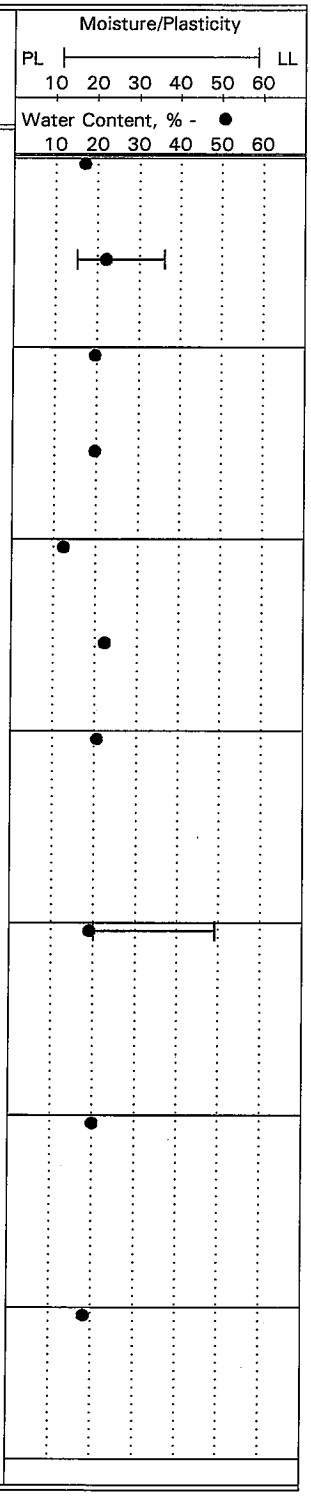
SOIL BORING LOG

Boring No. BH-23

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/17/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Cave-in @ 19.0 ft.

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			6/6" 5/6" 4/6"	Dk. Brn. SILTY CLAY Sl. Moist, Low Plasticity, Stiff		
				Brn. CLAY V. Moist, Med. Plasticity, Stiff LL=36, PI=21 Unconfined Compression Test: qu=1.7 tsf @ 13.9% Strain (2.5 to 4 ft.) Moist	104	
5			3/6" 4/6" 7/6"			
			5/6" 9/6" 13/6"	Reddish Brn., V. Stiff		
10			4/6" 7/6" 10/6"	Brn., Sl. Moist		
				Moist		
15			5/6" 7/6" 12/6"			
20			4/6" 8/6" 10/6"	Reddish Brn. & Gray, High Plasticity LL=49, PI=29		
25			5/6" 10/6" 13/6"	Brn. SANDY CLAY w/ Gravel Moist, Fl. Low Plasticity, V. Stiff		
30			8/6" 12/6" 15/6"	Reddish Brn., Gray & Olive Brn. SHALE Sl. Moist, Fl. High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-23 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/17/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			9/6" 14/6" 19/6"	Reddish Brn. & Gray			
40			13/6" 17/6" 23/6"	LL=61, PI=27	101		
45			14/6" 18/6" 25/6"	Gray, High Plasticity			
50			11/6" 15/6" 22/6"				
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

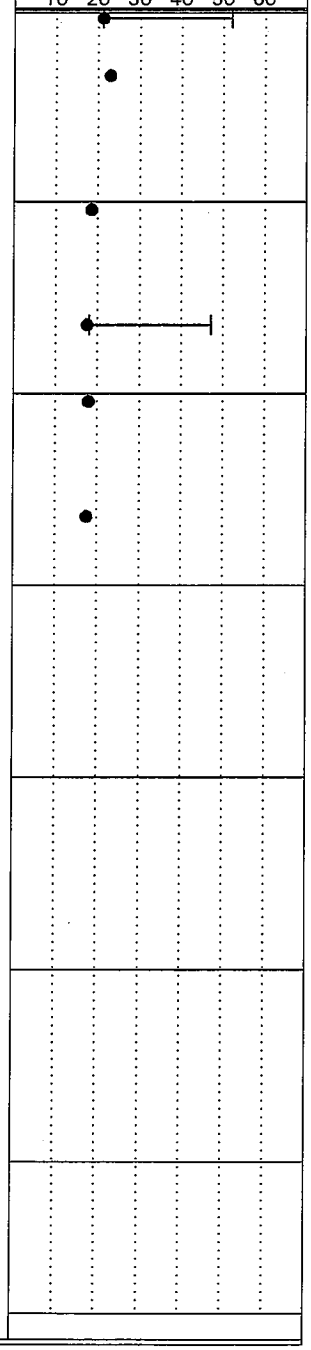
Boring No. BH-24

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/16/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. FAT CLAY Moist, High Plasticity USCS: CH; AASHTO: A-7-6(28) LL=52, PI=31 Brn. Unconfined Compression Test: qu=0.74 tsf @ 6.3% strain (1.5 to 3 ft.)	103	85.8
5						
				LL=47, PI=29		
10						
15						
20						
25						
30						

Moisture/Plasticity
PL — LL
10 20 30 40 50 60
Water Content, % - ●
10 20 30 40 50 60



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-25

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/17/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
0				Brn. SILTY CLAY Sl. Moist, Low Plasticity LL=31, PI=10	107		
5				Reddish Brn.CLAY Moist, High Plasticity			
				w/ Seams of Sand, Sl. Moist			
10				Moist LL=47, PI=30			
				w/ Seams of Sand & Gravel			
15				Reddish Brn. SANDY CLAY Sl. Moist, Med. Plasticity			
20							
25							
30							

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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

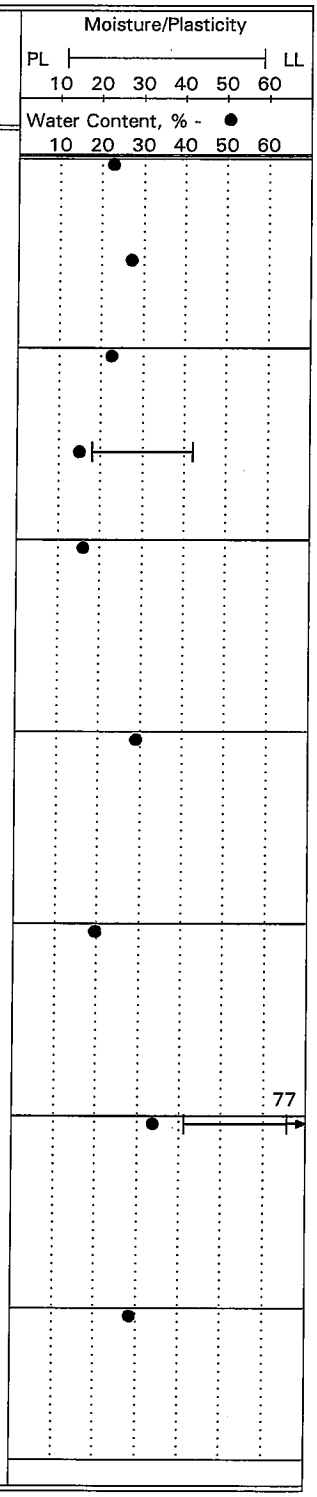
SOIL BORING LOG

Boring No. BH-26

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/18/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 11 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 3/6" 4/6"	Dk. Brn. SILTY CLAY Moist, Low Plasticity, Firm		
				Brn. SANDY CLAY w/ Gravel V. Moist, Med. Plasticity, Stiff		
5			2/6" 2/6" 3/6"	Gray CLAY Moist, Fl. High Plasticity, Firm		
				Lt. Gray & Lt. Brn. CLAYEY SAND WITH GRAVEL V. Moist, Fl. High Plasticity, Loose USCS: SC; AASHTO: A-2-7(1) LL=42, PI=24	110	23.9
10			3/6" 4/6" 4/6"	Lt. Brn., Med. Plasticity		
15			4/6" 7/6" 12/6"	Lt. Brn. & Lt. Gray CLAY Sl. Moist, Fl. High Plasticity, V. Stiff		
20			4/6" 12/6" 18/6"	Brn. & Gray SHALE Sl. Moist, Fl. High Plasticity, V. Stiff		
25			5/6" 9/6" 11/6"	Dk. Gray, High Plasticity LL=77, PI=36		
30			9/6" 10/6" 14/6"	Gray, V. Moist, Med. Plasticity		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

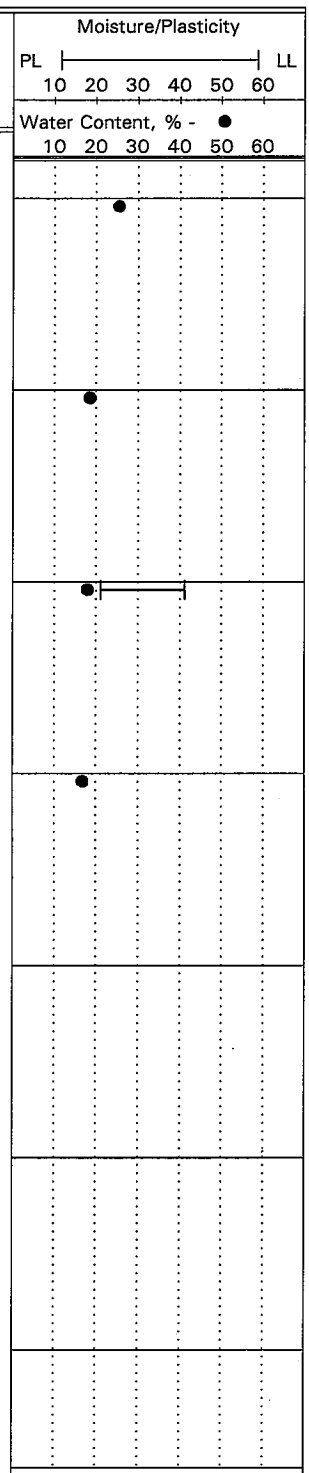
Boring No. BH-26 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/18/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
35			17/6" 12/6" 12/6"	Gray & Reddish Brn., Moist		
40			12/6" 22/6" 30/6"	Sl. Moist		
45			19/6" 29/6" 50/6"	Gray LL=41, PI=20	111	
50			17/6" 30/6" 43/6"			
55						
60						
65						

Moisture/Plasticity



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

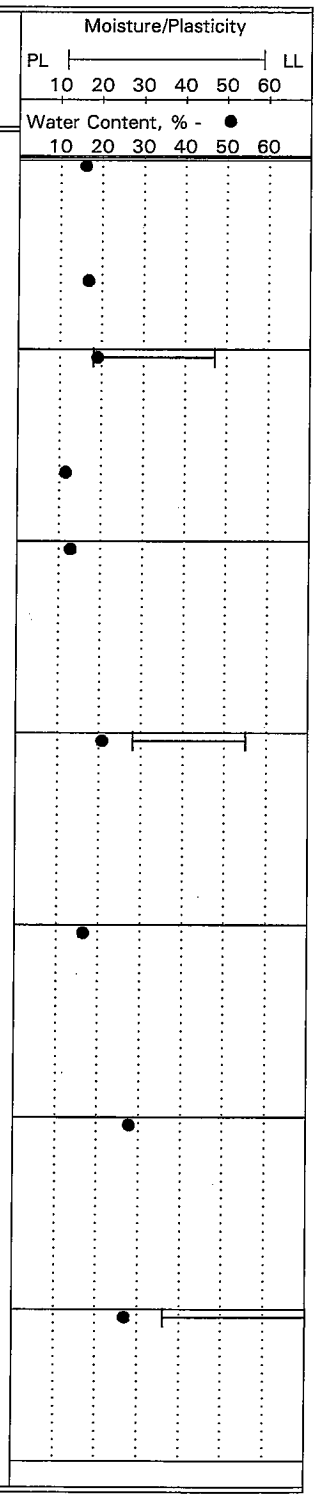
SOIL BORING LOG

Boring No. BH-27

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 4/12/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 9 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. SILTY CLAY Sl. Moist, Low Plasticity		
				Dk. Gray CLAY Sl. Moist, Med. Plasticity		
5				Brn. & Gray SANDY CLAY Moist, High Plasticity LL=47, PI=29		
			2/6" 3/6" 2/6"	Brn. SILTY SAND V. Moist, Nonplastic, Loose		
10			5/6" 9/6" 11/6"	w/ Gravel, Med. Dense		
15			5/6" 10/6" 14/6"	Reddish Brn. & Gray SHALE Sl. Moist, Fl. High Plasticity, V. Stiff LL=55, PI=27		
20			7/6" 18/6" 15/6"	Gray, Brn. & Reddish Brn.		
25			5/6" 7/6" 10/6"	Gray, High Plasticity		
30			4/6" 8/6" 11/6"	LL=70, PI=34	93	



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-27 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 4/12/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			11/6" 17/6" 27/6"	Reddish Brn. & Olive Brn., w/ Gravel, Med. Plasticity			
40			9/6" 20/6" 18/6"	Reddish Brn., w/ Gravel			
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

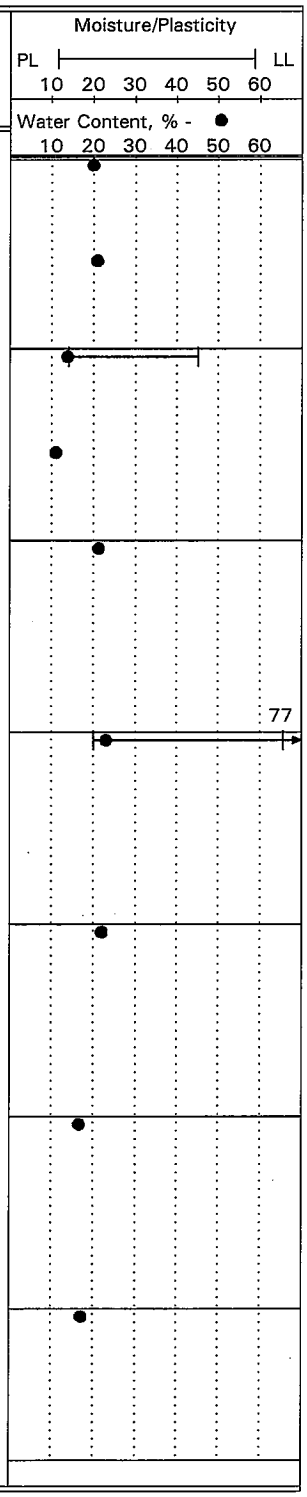
SOIL BORING LOG

Boring No. BH-28

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/26/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			3/6" 3/6" 3/6"	Dk. Brn. & Brn. CLAY Moist, Fl. Low Plasticity, Firm		
				Brn., High Plasticity		
5			4/6" 7/6" 10/6"	Brn. SANDY CLAY Moist, High Plasticity, V. Stiff LL=45, PI=31		
				Brn. & Gray CLAY WITH SAND Sl. Moist, High Plasticity		
10			3/6" 6/6" 8/6"	Brn. & Gray FAT CLAY Moist, High Plasticity, Stiff		
15			4/6" 6/6" 6/6"	LL=77, PI=57	101	
20			5/6" 6/6" 7/6"			
25			9/6" 17/6" 22/6"	Brn. & Gray SHALE Sl. Moist, High Plasticity, V. Stiff		
30			11/6" 19/6" 26/6"	Brn., Gray & Reddish Brn.		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-28 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/26/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - 10 20 30 40 50 60)
35			12/6" 14/6" 19/6"	Gray & Reddish Brn., Moist LL=61, PI=36			
			9/6" 31/6" 23/6"	Sl. Moist			
40							
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

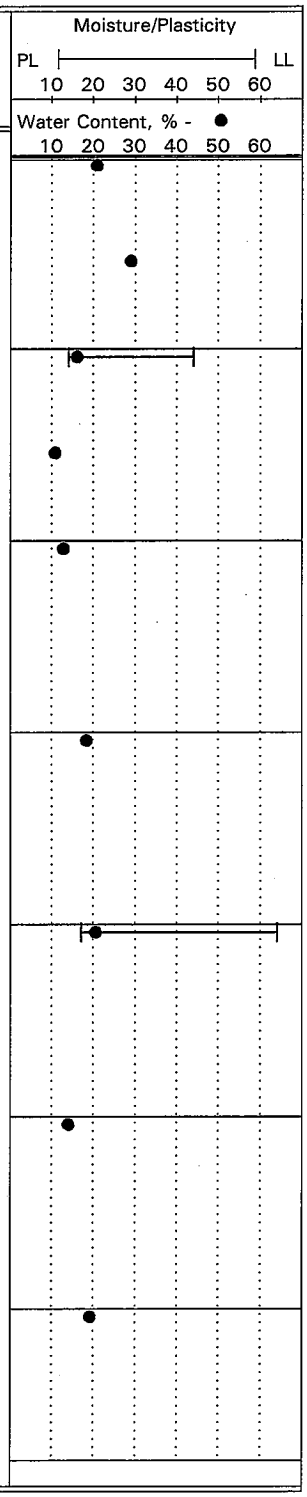
SOIL BORING LOG

Boring No. BH-29

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/25/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 40 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 2/6" 2/6"	Dk. Brn. & Brn. CLAY Moist, Fl. Low Plasticity, Soft		
				Brn., High Plasticity, Firm		
5			5/6" 6/6" 7/6"	Brn. SANDY CLAY Moist, High Plasticity, Stiff LL=44, PI=30		
				Brn. & Gray, Sl. Moist		
10			4/6" 7/6" 10/6"	V. Stiff		
15			2/6" 5/6" 6/6"	Moist, Stiff		
20			4/6" 7/6" 11/6"	Gray & Brn. FAT CLAY Moist, High Plasticity, V. Stiff LL=64, PI=47		
25			10/6" 18/6" 27/6"	Brn. & Lt. Brn. SHALE w/ Sand & Gravel Sl. Moist, Med. Plasticity, V. Stiff		
30			12/6" 26/6" 27/6"	Reddish Brn & Gray SHALE Sl. Moist, High Plasticity, V. Stiff		



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-29 continued

Project: Ft. Sill AIT Barracks — Project No.: 7310-3184

Project Location: Lawton, Oklahoma — Date Drilled.: 3/25/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			12/6" 18/6" 22/6"	Gray			
40			11/6" 20/6" 24/6"	Gray & Reddish Brn.			
45			9/6" 16/6" 23/6"	Reddish Brn. & Gray LL=57, PI=31	101		
50			20/6" 29/6" 29/6"	Reddish Brn.			
55							
60							
65							

Page: 2 of 2 for boring BH-29

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

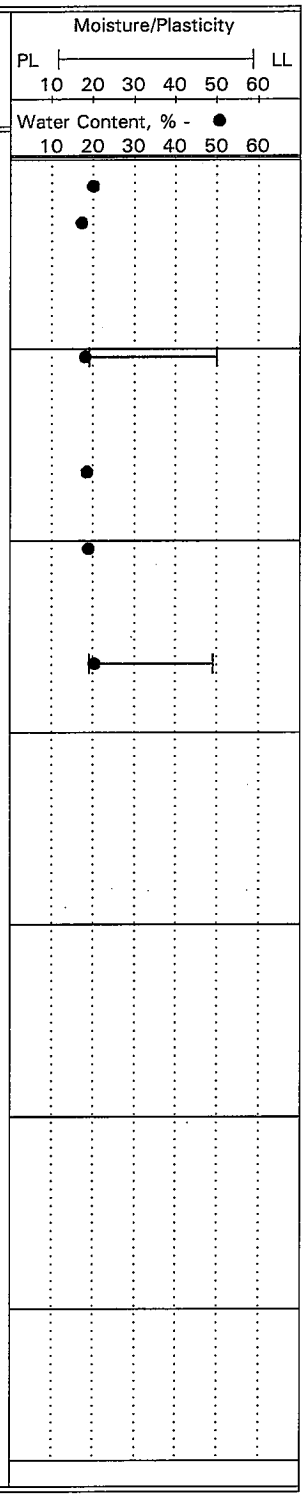
SOIL BORING LOG

Boring No. BH-30

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/24/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				3.5" ASPHALT		
				3" AGGREGATE		
				Dk. Grayish Brn. CLAY Moist, Fl. High Plasticity		
				Brn. FAT CLAY Moist, High Plasticity		
5				Brn. CLAYEY SAND V. Moist, High Plasticity USCS: SC; AASHTO: A-7-6(11) LL=50, PI=31 Unconfined Compression Test: qu=3.1 tsf @ 7.6% strain (5 to 6.5 ft.)	108	49.9
				Lt. Brn. CLAY Moist, High Plasticity		
10						
				w/ Seams of Sand LL=49, PI=30		
15				Lt. Brn. SANDY CLAY Moist, Med. Plasticity		
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

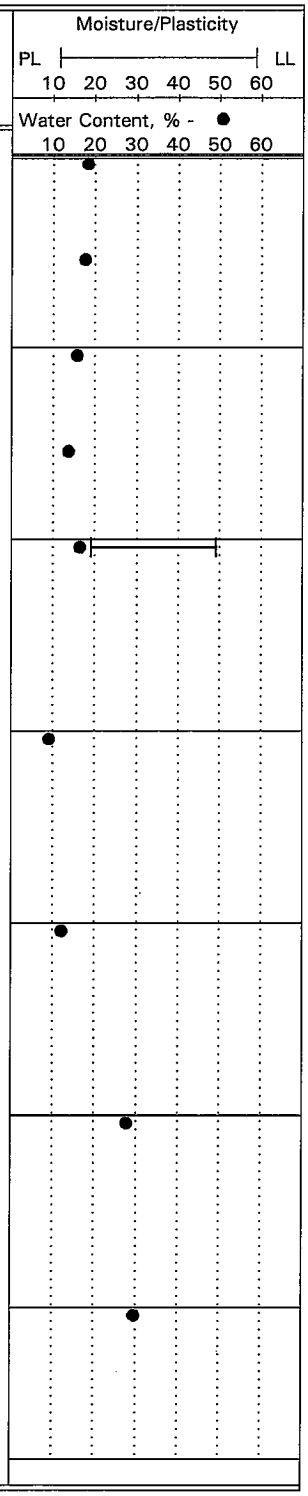
SOIL BORING LOG

Boring No. BH-31

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/19/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: 20 ft. @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 2/6" 4/6"	Dk. Brn. SILTY CLAY Moist, Low Plasticity, Firm		
				Brn. FAT CLAY Sl. Moist, High Plasticity, Firm		
5			4/6" 9/6" 12/6"	Brn. FAT CLAY WITH SAND Sl. Moist, High Plasticity, V. Stiff		
				Unconfined Compression Test: qu=3.0 tsf @ 2.9% strain (7.5 to 10 ft.)	111	
10			3/6" 6/6" 9/6"	Lt. Brn. & Gray SANDY CLAY Sl. Moist, High Plasticity, Stiff LL=49, PI=30		
15			5/6" 6/6" 8/6"	Brn. SILTY SAND (Medium Grain) V. Moist, Nonplastic, Med. Dense		
20			8/6" 7/6" 15/6"	w/ Gravel, Wet		
25			6/6" 11/6" 14/6"	Reddish Brn. & Gray SHALE Sl. Moist, Fl. High Plasticity, V. Stiff		
30			6/6" 12/6" 15/6"	Gray & Reddish Brn.		



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-31 continued

Project: Ft. Sill AIT Barracks
Project No.: 7310-3184
Project Location: Lawton, Oklahoma
Date Drilled.: 3/19/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity (PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60)
35			12/6" 19/6" 32/6"	LL=63, PI=27			
40			19/6" 23/6" 26/6"				
45							
50							
55							
60							
65							

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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

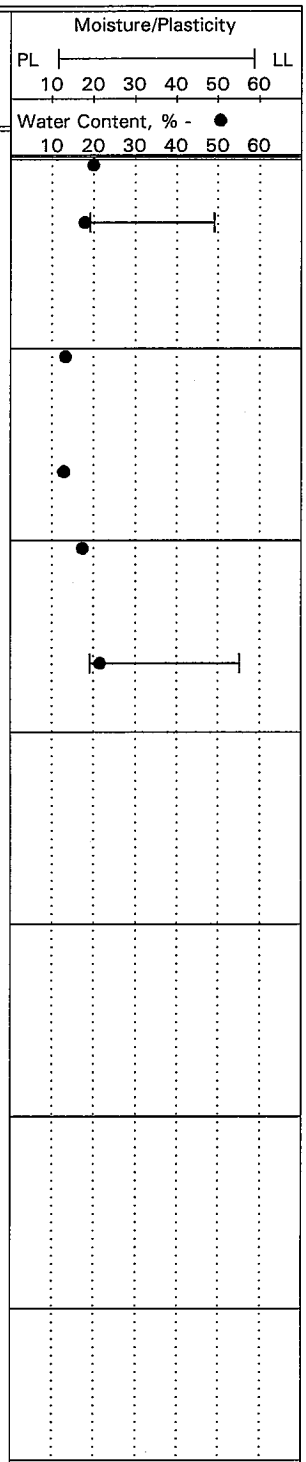
SOIL BORING LOG

Boring No. BH-32

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/18/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Brn. CLAY Moist, High Plasticity LL=49, PI=30		
5				Brn. FAT CLAY WITH SAND Sl. Moist, High Plasticity		
10						
				LL=55, PI=36 Unconfined Compression Test: qu=1.7 tsf @ 2.9% strain (13 to 15 ft.)	106	
15						
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

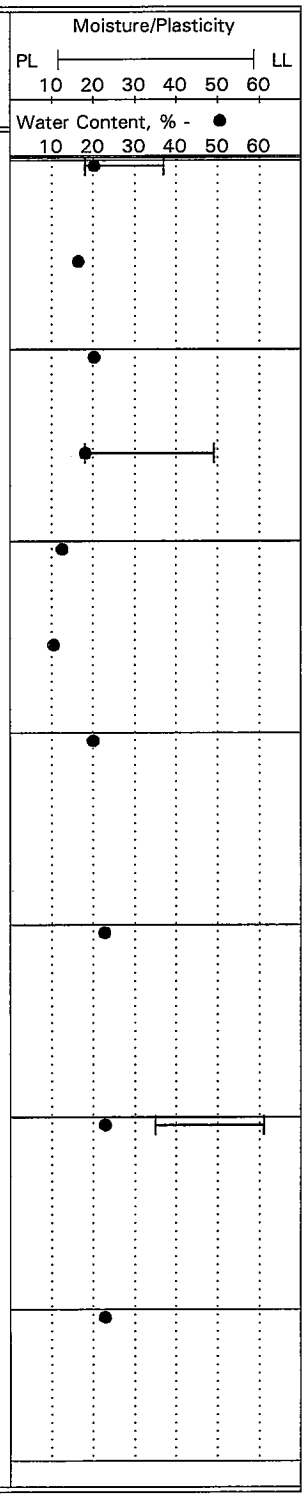
SOIL BORING LOG

Boring No. BH-33

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/18/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0			2/6" 3/6" 4/6"	Dk. Brn. CLAY Moist, Med. Plasticity, Firm LL=37, PI=19		
				Brn., w/ Nylon Tarp, High Plasticity, Stiff		
5			4/6" 5/6" 6/6"	Moist		
			3/6" 4/6" 5/6"	Brn. & Gray, w/ Nylon Tarn LL=49, PI=31	105	
10			3/6" 5/6" 5/6"	Lt. Brn. CLAYEY SAND V. Moist, Fl. High Plasticity, Loose		
15			5/6" 5/6" 5/6"	Lt. Brn. SILTY SAND V. Moist, Nonplastic, Loose		
20			7/6" 13/6" 21/6"	Gray & Reddish Brn. SHALE Sl. Moist, Fl. High Plasticity, V. Stiff		
25			6/6" 12/6" 16/6"	LL=61, PI=26		
30			8/6" 11/6" 19/6"			



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STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

SOIL BORING LOG

Boring No. BH-33 continued

Project: Ft. Sill AIT Barracks Project No.: 7310-3184

Project Location: Lawton, Oklahoma Date Drilled.: 3/18/10

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve	Moisture/Plasticity PL 10 20 30 40 50 60 LL; Water Content, % - ● 10 20 30 40 50 60
35			11/6" 14/6" 20/6"	Gray			
40			12/6" 29/6" 33/6"				
45							
50							
55							
60							
65							

Page: 2 of 2 for boring BH-33

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

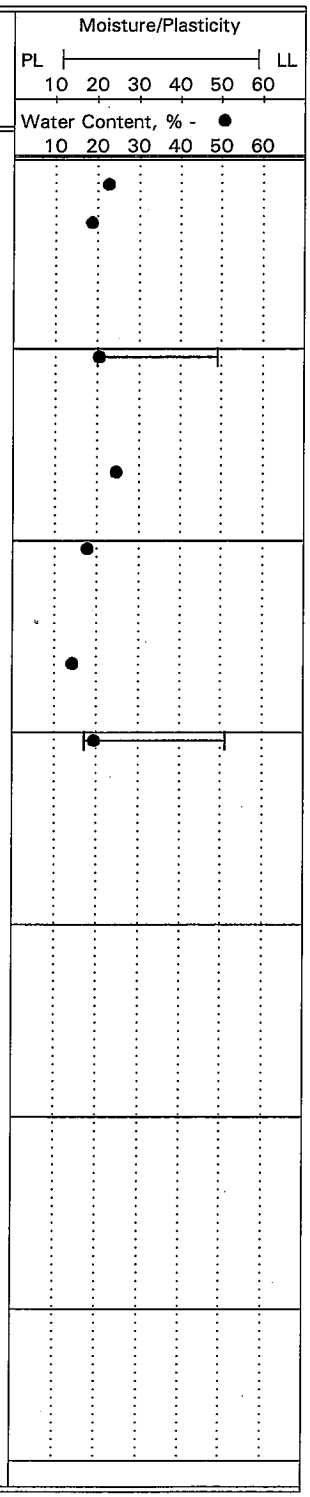
SOIL BORING LOG

Boring No. BH-34

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/23/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				3" ASPHALT		
				3" AGGREGATE		
				Dk. Brn. & Brn. CLAY Moist, High Plasticity Brn., Med. Plasticity	107	
5				LL=49, PI=29		
				Brn. SANDY CLAY Moist, Fl. Low Plasticity		
10				Brn. & Gray		
15				Brn. FAT CLAY Moist, High Plasticity LL=51, PI=34		
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

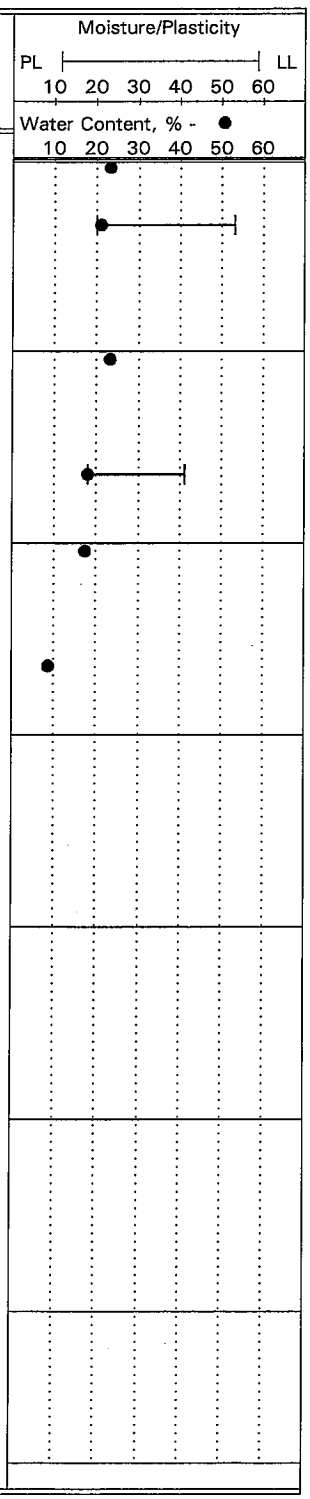
SOIL BORING LOG

Boring No. BH-35

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/19/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				Dk. Brn. CLAY Moist, Med. Plasticity		
				Brn. FAT CLAY Moist, High Plasticity LL=53, PI=33		
5						
				Brn. SANDY CLAY Moist, Med. Plasticity LL=41, PI=23 Unconfined Compression Test: qu=1.0 tsf @ 1.7% strain (8 to 10 ft.)	107	
10				Brn. CLAY WITH SAND Sl. Moist, Fl. High Plasticity w/ Seams of Sand		
15				Brn. CLAY Sl. Moist, Fl. High Plasticity		
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

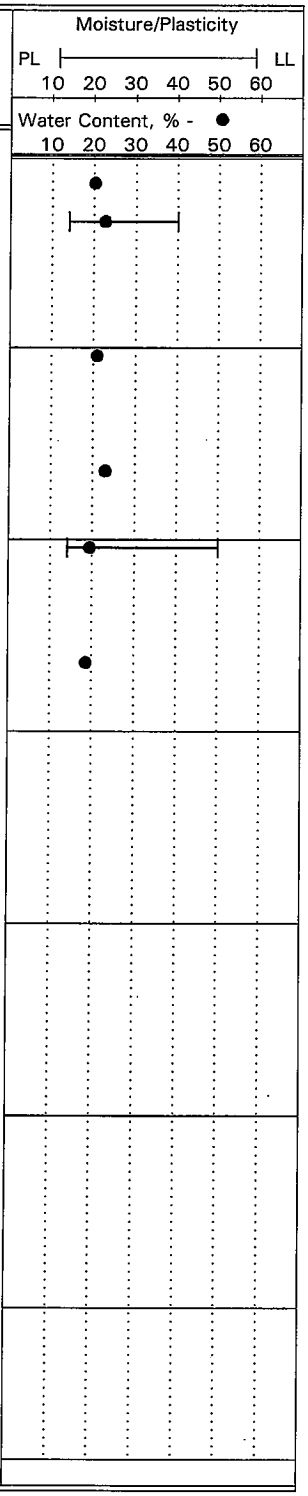
SOIL BORING LOG

Boring No. BH-36

Project: Ft. Sill AIT Barracks
Project Location: Lawton, Oklahoma
Boring Location: See "Site and Boring Location Plan"
Drill Method: CME-55 w/ 3.25" I.D. HSA
Surface Elevation:
Remarks:

Project No.: 7310-3184
Date Drilled.: 3/22/10
Project Engineer: Jieliang Pan, P.E.
Field Logger: Jieliang Pan
Water Depth: Dry @ Completion

Elev./Depth Feet	Symbol	Samples	SPT Blows/ Increment	Soil Description	Dry Density (pcf)	% Passing #200 Sieve
0				3" ASPHALT 3" AGGREGATE Dk. Grayish Brn. CLAYEY SAND WITH GRAVEL V. Moist, Fl. High Plasticity USCS: SC; AASHTO: A-2-6(0) LL=40, PI=26 Unconfined Compression Test: qu=2.0 tsf @ 8.2% strain (1.5 to 3.5 ft.)	103	17.8
5				Dk. Grayish CLAY V. Moist, Fl. High Plasticity		
				Brn. SANDY CLAY V. Moist, Med. Plasticity		
10				Brn. FAT CLAY V. Moist, High Plasticity LL=50, PI=36		
15						
20						
25						
30						



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STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

KEY TO SYMBOLS

Symbol	Description
STRATA SYMBOLS	
	Asphalt
	Aggregate
	Fat Clay
	Shale
	Lean Clay with Sand
	Sandy Clay
	Gravel with Silt and Sand
	Silty Sand
	Lean Clay
	Silty Clay
	Clayey Sand
	Fat Clay with Sand
	Silty Sand with Gravel
	Sandy Fat Clay

Symbol	Description
	Boring continues

Misc. Symbols

	Water level at completion of drilling operations

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

KEY TO SYMBOLS

Symbol	Description
Soil Samplers	
◪	Standard Penetration Test, ASTM D1586
□	3" Undisturbed Thin-Walled Tube (Shelby tube), ASTM D1587
☒	Bulk sample taken from auger flights, ASTM D1452
▯	5" Undisturbed Thin-Walled Tube (Shelby tube), ASTM D1587
■	Diamond Core Drilling, ASTM D2113-83

STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

DEFINITION OF DESCRIPTIVE TERMS

Consistency of Cohesive Soils (at moisture content near plastic limit):
- Very Soft - Easily penetrated 4" to 6" by fist; tall core will sag under its own weight.
- Soft - Easily molded by fingers.
- Firm - Can be penetrated 2" to 3" by thumb with moderate effort, imprinted with fingers.
- Stiff - Readily indented by thumb but penetrated only with great effort.
- Very Stiff - Readily indented by thumbnail, imprinted very slightly with pressure from fingers.
- Hard - Indented with difficulty by thumbnail, cannot be imprinted with fingers.

Density of Cohesionless Soils:
- Very Loose - less than 4 SPT "N" value corrected for overburden.
- Loose - 5 to 10 SPT "N" value corrected for overburden.
- Medium Dense - 11 to 30 SPT "N" value corrected for overburden.
- Dense - 31 to 50 SPT "N" value corrected for overburden.
- Very Dense - 51 to 50/6" SPT "N" value corrected for overburden.
- Hard - less than 6" penetration in 50 SPT "N" blows corrected for overburden (cemented).

Hardness of Rock:
- Very Soft - can be scratched readily by fingernail
- Soft - can be grooved readily by knife or pick
- Medium - can be grooved 0.05" deep by firm pressure of knife
- Moderately Hard - can be scratched by knife
- Hard - can be scratched by knife or pick only with difficulty
- Very Hard - cannot be scratched by knife or sharp pick

Other Terms Descriptive of Consistency:
- Brittle - Ruptures with little deformation
- Friable - Crumbles or pulverizes easily.
- Elastic - Returns to original length after small deformation.
- Spongy - Is very porous, loose and elastic.
- Sticky - Adheres or sticks to tools or hands.

In Situ Moisture Descriptions:
- Dry - powdery
- Slightly Moist - water not readily absorbed by paper
- Moist - water readily absorbed by paper
- Very Moist - water condenses on sample tray
- Wet - water drips from sample

Degree of Plasticity When Moist to Very Moist:
- Nonplastic - cannot be rolled into a ball
- Trace of Plasticity - can be rolled into a ball but not into a 1/8" thread
- Low Plasticity - barely holds its shape when rolled into a 1/8" thread
- Fairly Low Plasticity - 1/8" thread quickly ruptures when bent
- Medium Plasticity - 1/8" thread withstands considerable deformation without rupture.
- Fairly High Plasticity - difficult to rupture a 1/8" thread by bending.
- High Plasticity - can be kneaded without rupture; greasy texture.

Abbreviations:

V. - Very	Dk. - Dark	Blk. - Black
Tr. - Trace	Lt. - Light	Brn. - Brown
Fl. - Fairly	Med. - Medium	
Sl. - Slightly		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

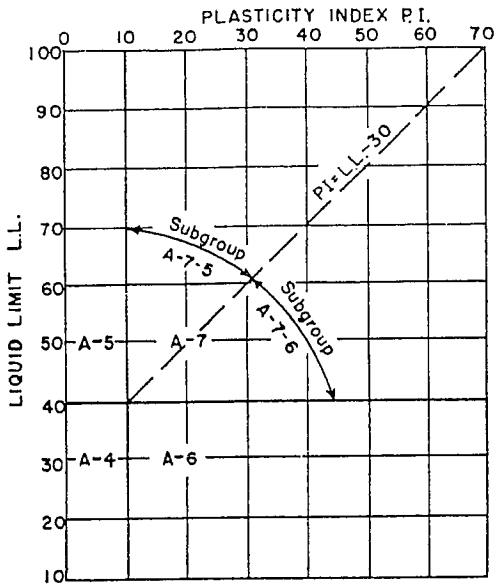
ATTACHMENT C

AASHTO Soil Classification System

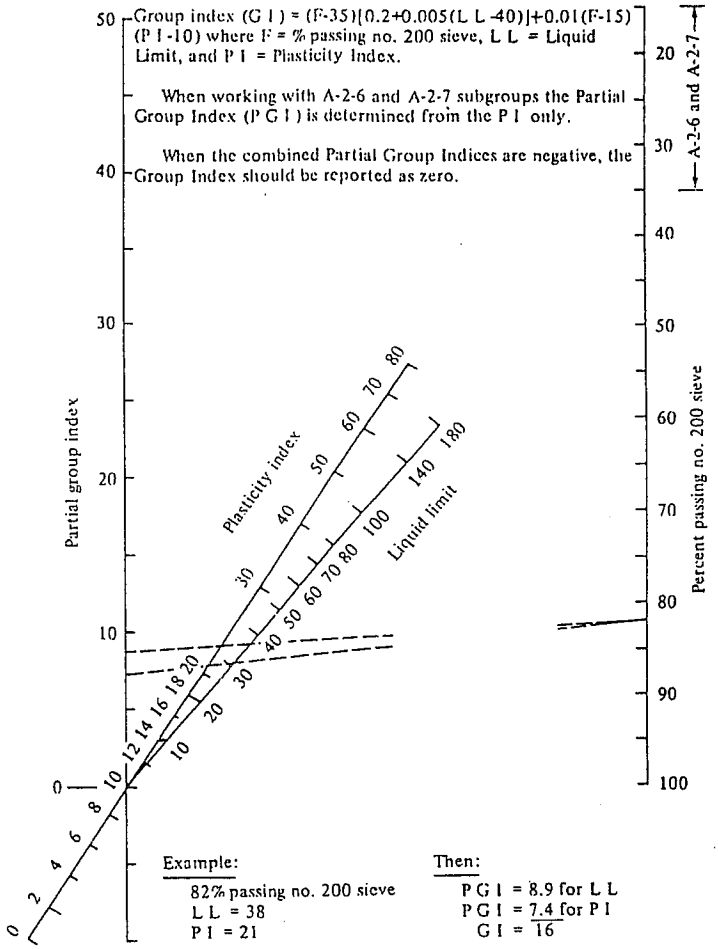
Unified Soil Classification System

Soil Classification System — American Association of State Highway and Transportation Officials

The tables and charts given below are from AASHTO Designation: M 145-83, The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes. More detailed information as to the background and application of the system may be obtained from the report.



Liquid-limit and plasticity-index ranges for the A-4, A-5, A-6 and A-7 subgrade groups.



Group index chart

Classification of Soils and Soil-Aggregate Mixtures (with Suggested Subgroups)

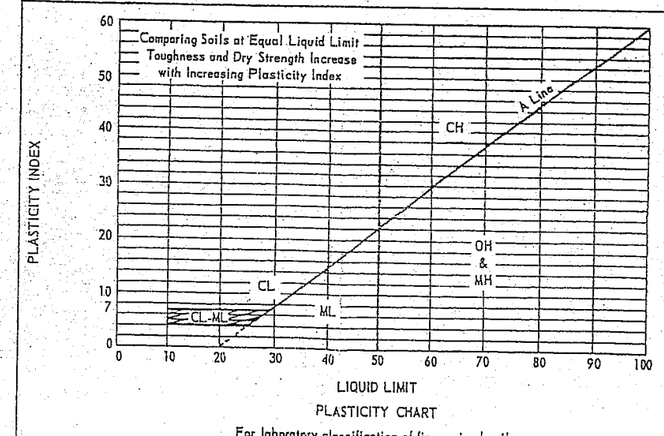
General classification	Granular materials (35 per cent or less passing No. 200)							Silt-clay materials (More than 35 per cent passing No. 200)			
Group classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5; A-7-6
Sieve analysis: Per cent passing:											
No. 10	50 max.	—	—	—	—	—	—	—	—	—	—
No. 40	30 max.	50 max.	51 min.	—	—	—	—	—	—	—	—
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing No. 40:											
Liquid limit	—		—	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		NP	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.*
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General rating as subgrade	Excellent to good					Fair to poor					

*P.I. of A-7-5 subgroup is equal to or less than L.L. minus 30. P.I. of A-7-6 subgroup is greater than L.L. minus 30

UNIFIED SOIL CLASSIFICATION

(Including Identification and Description)

Major Divisions (1)	(2)		Group Symbols (3)	Typical Names (4)	Field Identification Procedures (Excluding particles larger than 3 inches and basing fractions on estimated weights) (5)	Information Required for Describing Soils (6)	Laboratory Classification Criteria (7)
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Gravels with (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% GW, GP, SW, SP. More than 12% GM, GC, SM, SC. 5% to 12% Borderline cases requiring use of dual symbols.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3. Not meeting all gradation requirements for GW. Atterberg limits below "A" line or PI less than 4. Atterberg limits above "A" line with PI greater than 7. Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SP	Poorly-graded sands, gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size; rounded and subangular sand grains coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3. Not meeting all gradation requirements for SW. Atterberg limits below "A" line or PI less than 4. Atterberg limits above "A" line with PI greater than 7. Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).		
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).		
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Silts and Clays: Liquid limit less than 50				Identification Procedures on Fraction Smaller than No. 40 Sieve Size: Dry Strength (Crushing characteristics); Dilatancy (Reaction to shaking); Toughness (Consistency near PL)		Use grain-size curve in identifying the fractions as given under field identification.
			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight; Quick to slow; None	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high; None to very slow; Medium		
	Silts and Clays: Liquid limit greater than 50		OL	Organic silts and organic silty clays of low plasticity.	Slight to medium; Slow; Slight		
			MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium; Slow to none; Slight to medium	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.	
			CH	Inorganic clays of high plasticity, fat clays.	High to very high; None; High		
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high; None to very slow; Slight to medium	Example: Clayey silt, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess, (ML).	
Highly Organic Soils			Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		



PLASTICITY CHART

For laboratory classification of fine-grained soils

(1) Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U. S. standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky. Place the pat in the open palm of one hand and shake horizontally, striking vigourosly against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measrue of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit)

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

ATTACHMENT D

Summary of Laboratory Test Results

Corrosion Testing Results

Modified Proctor Test Evaluations

CBR Test Reports

Unconfined Compression Test Results

Unconsolidated-Undrained (UU) Triaxial Test Results

Consolidation Test Results

Swell Test Results

Direct Shear Test Results

Redox Test Reports

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-1	A	0-2.5	21.8																		
	B	2.5-5	20.6	105	51	18	33														
	C	5-7.5	20.6																		
	D	7.5-10	18.6																		
	E	10-12.5	16.2																		
	F	12.5-15	22.4																		
	G	15-17.5	21.3	111	59	23	36														
	H	20-22.5	15.2																		
	I	25-27.5	14.9																		
	J	30-32.5	19.7																		
	K	35-37.5	22.7																		
	L	40-42.5	29.1																		
	M	45-47.5	22.7		68	39	29														
BH-2	A	0-2.5	23.3																		
	B	2.5-5	20.3	100	52	19	33														
	C	5-7.5	22.3																		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-2 (cont.)	D	7.5-10	25.9																		
	E	10-12.5	17.6																		
	F	12.5-15	14.5		41	16	25														
	G	15-17.5	15.6																		
	H	20-22.5	4.7		Nonplastic			100	91	80	69	64	49	35	16	11	9.1	GW-GM	A-1-a		
	I	25-27.5	16.8																		
	J	30-32.5	23.0																		
	K	35-37.5	22.5	103	50	23	27														
	L	40-42.5	26.9																		
BH-3	A	0-2.5	12.8																		
	B	2.5-5	20.6	105	49	17	32														
	C	5-7.5	19.8																		
	D	7.5-10	17.0																		
	E	10-12.5	9.4																		
	F	12.5-15	21.2																		
	G	15-17.5	14.6	106	47	14	33														

SUMMARY OF LABORATORY TEST RESULTS

STANDARD TESTING AND ENGINEERING COMPANY

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-3 (cont.)	H	16.5-18	17.9																		
	I	20-22.5	15.9																		
	J	25-27.5	18.3																		
	K	30-32.5	21.6		57	24	33														
BH-4	A	0-2.5	19.9																		
	B	2.5-5	19.0																		
	C	5-7.5	16.2		38	19	19	100	100	100	100	100	100	100	98	95	90.1	CL	A-6(17)		
	D	7.5-10	17.3	115																5.1	3.2
	E	10-12.5	15.3																		
	F	15-17.5	22.0																		
	G	20-22.5	9.3																		
	H	25-27.5	22.7	104	54	31	23														
	I	30-32.5	16.7																		
	J	35-37.5	14.0																		
	K	40-42.5	16.2																		
	L	45-47.5	26.0																		
	M	50-52.5	19.4		60	35	25														

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-5	A	0-1.5	20.9																		
	B	1.5-3.5	20.1																		
	C	5-6.5	18.0		52	19	33														
	D	8-10	20.3																		
	E	10-11.5	17.2																		
	F	13-15	17.2																		
	G	15-16.5	16.4		41	16	25														
BH-6	A	0-1.5	18.2																		
	B	1.5-3.5	15.4		51	20	31														
	C	5-6.5	20.8																		
	D	8-10	18.3																		
	E	10-11.5	17.3		46	19	27														
	F	13-15	8.3																		
BH-7	A	0-2.5	26.2																		
	B	2.5-5	19.8																		
	C	5-7.5	21.2	103	55	20	35														
	D	7.5-10	13.4																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

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Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-7 (cont.)	E	10-12.5	18.5																		
	F	15-17.5	17.3																		
	G	20-22.5	15.8	111	38	18	20														
	H	25-27.5	15.5																		
	I	30-32.5	19.8																		
	J	35-37.5	16.9																		
	K	40-42.5	16.0		43	21	22														
BH-8	A	0-2.5	25.6		43	21	22														
	B	2.5-5	21.7																		
	C	5-7.5	21.6																		
	D	7.5-10	16.2																		
	E	10-12.5	19.6																		
	F	12.5-15	21.4																		
	G	15-17.5	14.9		42	18	24														
	H	20-22.5	15.1																		
	I	25-27.5	27.4																		
	J	30-32.5	28.6																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

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Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-8 (cont.)	K	35-37.5	14.2		34	17	17														
	Rock Core	37.5-38	19.4	104																0.96	2.6
		39.5-40	14.6	110																0.59	1.4
BH-9	A	0-2.5	15.4		41	15	26														
	B	2.5-5	21.5																		
	C	5-7.5	14.6	111																	
	D	7.5-10	13.5																		
	E	10-12.5	5.7																		
	F	15-17.5	22.4																		
	G	20-22.5	22.3																		
	H	25-27.5	20.2	103	44	19	25														
	I	30-32.5	20.2																		
	J	35-37.5	12.8																		
	K	40-42.5	19.1		55	28	27														
BH-10	A	0-2.5	19.8																		
	B	2.5-5	22.2																		
	C	5-7.5	21.8																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

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Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-10 (cont.)	D	7.5-10	20.2	102	54	21	33	100			100	100	100	100	96	88	79.7	CH	A-7-6(27)		
	E	10-12.5	15.5																		
	F	15-17.5	14.6																		
	G	20-22.5	15.6																		
	H	25-27.5	20.7																		
	K	40-42.5	25.6		45	27	18														
	L	45-47.5	26.8																		
	M	50-52.5	30.9																		
BH-11	A	0-2.5	20.6																		
	B	2.5-5	15.5																		
	C	5-7.5	17.1																		
	D	7.5-10	16.6																		
	E	10-12.5	14.1																		
	F	12.5-15	9.5		35	17	18														
	G	15-17.5	9.6																		
	H	20-22.5	18.0																		
	I	25-27.5	14.9																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-11 (cont.)	J	30-32.5	16.5		42	18	24														
	K	35-37.5	20.0																		
	L	40-42.5	25.7																		
	M	45-47.5	26.6																		
	N	50-52.5	21.2	93	62	33	29														
BH-12	A	0-2.5	20.6																		
	B	2.5-5	19.3																		
	C	5-7.5	17.5	111	55	21	34														
	D	7.5-10	14.6																		
	E	10-12.5	16.8		41	14	27														
	F	15-17.5	10.5																		
	G	20-22.5	20.5																		
	H	25-27.5	15.3																		
	I	30-32.5	29.5																		
	J	35-37.5	17.3																		
	Rock Core	39.5-40	13.6	119																4.1	6.0
		40-40.5	11.6	120																2.9	9.8

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-13	A	0-1.5	17.0																		
	B	1.5-3.5	14.3		33	14	19														
	C	5-6.5	19.2																		
	D	8-10	16.1																		
	E	10-11.5	18.3																		
	F	13-15	20.9		61	22	39														
BH-14	A	0-1.5	19.7		45	15	30														
	B	1.5-3.5	20.6	105																2.3	7.6
	C	5-6.5	19.4		54	15	39														
	D	8-10	18.2																		
	E	10-11.5	14.5		45	14	31														
	F	13-15	12.0																		
BH-15	A	0-2.5	21.5																		
	B	2.5-5	23.5		57	20	37														
	C	5-7.5	17.6																		
	D	7.5-10	9.5																		
	E	10-12.5	14.5	114	43	17	26	100	100	100	100	100	100	99	75	60	55.8	CL	A-7-6(11)		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-15 (cont.)	F	12.5-15	17.1																		
	G	15-17.5	17.9																		
	H	20-22.5	22.4																		
	I	25-27.5	12.9																		
	J	30-32.5	19.9																		
	K	35-37.5	14.0																		
	Rock Core	36.5-37	10.0	132																17.4	2.4
		39-39.5	10.6	130																12.2	2.5
BH-16	A	0-2.5	21.6																		
	B	2.5-5	22.4																		
	C	5-7.5	21.9	104	55	20	35														
	D	7.5-10	18.8																		
	E	10-12.5	15.6																		
	F	15-17.5	21.4		73	21	52														
	G	20-22.5	18.6																		
	H	25-27.5	10.4																		
	I	30-32.5	22.3																		

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-16 (cont.)	J	35-37.5	23.7	98	X	X	X														
	K	40-42.5	23.3																		
BH-17	A	0-2.5	19.6																		
	B	2.5-5	19.5	104	61	17	44														
	C	5-7.5	21.9	103																1.3	5.9
	D	7.5-10	15.7																		
	E	10-12.5	18.2																		
	F	12.5-15	15.7	107																	
	G	15-17.5	25.4																		
	H	20-22.5	21.4		60	24	36														
	I	25-27.5	13.7																		
	J	30-32.5	25.6																		
	K	35-37.5	20.9																		
	L	40-42.5	29.2		63	24	39														
BH-18	A	0-2.5	22.8																		
	B	2.5-5	22.9	102	61	17	44														
	C	5-7.5	21.3																		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

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					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-18 (cont.)	D	7.5-10	19.8																		
	E	10-12.5	17.6																		
	F	15-17.5	15.7	111	51	15	36														
	G	20-22.5	7.2																		
	H	25-27.5	22.7																		
	I	30-32.5	24.5																		
	J	35-37.5	22.2																		
	K	40-42.5	27.7																		
	L	45-47.5	24.7																		
	M	50-52.5	29.5		56	24	32														
BH-19	A	0-1.5	19.2																		
	B	1.5-3.5	13.6		54	16	38														
	C	5-6.5	22.1																		
	D	8-10	11.6																		
	E	10-11.5	18.0																		
	F	13-15	17.4	111	42	13	29	100	100	100	100	100	100	100	82	68	54.2	CL	A-7-6(11)	2.2	4.5
BH-20	A	0-2.5	17.3	103	51	16	35														

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Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-20 (cont.)	B	2.5-5	19.5																		
	C	5-7.5	20.3																		
	D	7.5-10	16.4																		
	E	10-12.5	16.0																		
	F	15-17.5	20.2		64	17	47														
	G	20-22.5	19.5																		
	H	25-27.5	13.5																		
	I	30-32.5	12.0																		
	J	35-37.5	13.1	117	28	12	16														
	K	40-42.5	16.1																		
	L	45-47.5	22.8																		
	M	50-52.5	21.9																		
BH-21	A	0-2.5	27.5																		
	B	2.5-5	6.7	115	34	10	24														
	C	5-7.5	22.9																		
	D	7.5-10	18.8																		
	E	10-12.5	19.7																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.
Date: May 7, 2010
Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.
Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-21 (cont.)	F	12.5-15	13.5		53	15	38														
	G	15-17.5	10.6																		
	H	20-22.5	20.7																		
	I	25-27.5	14.4																		
	J	30-32.5	12.7																		
	K	35-37.5	10.3		34	13	21														
	Rock Core	36-36.5	11.3	129																20.6	3.6
		36.5-37	15.9	115																3.6	1.9
		40-40.5	18.2	111																1.2	1.8
BH-22	A	0-2.5	20.4																		
	B	2.5-5	19.0																		
	C	5-7.5	15.0	102	53	19	34														
	D	7.5-10	16.2																		
	E	10-12.5	15.5																		
	F	15-17.5	16.3																		
	G	20-22.5	17.4	108	53	15	38														
	H	25-27.5	11.4					100	100	100	100	96	95	95	60	52	48.4				

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-22 (Cont.)	I	30-32.5	10.8																		
	J	35-37.5	19.5																		
	K	40-42.5	22.3		60	31	29														
BH-23	A	0-2.5	16.9																		
	B	2.5-5	22.0	104	36	15	21													1.7	13.9
	C	5-7.5	19.5																		
	D	7.5-10	19.6																		
	E	10-12.5	12.3																		
	F	12.5-15	22.3																		
	G	15-17.5	20.6																		
	H	20-22.5	19.1		49	20	29														
	I	25-27.5	20.0																		
	J	30-32.5	18.2																		
	K	35-37.5	23.4																		
	L	40-42.5	25.8	101	61	34	27														
	M	45-47.5	33.5																		
	N	50-52.5	26.0																		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-24	A	0-1.5	21.2		52	21	31	100	100	100	100	100	100	98	94	89	85.8	CH	A-7-6(28)		
	B	1.5-3.5	22.9	103																0.74	6.3
	C	5-6.5	18.5																		
	D	8-10	17.5		47	18	29														
	E	10-11.5	17.9																		
	F	13-15	17.5																		
BH-25	A	0-1.5	18.9																		
	B	1.5-3.5	14.9	107	31	21	10														
	C	5-6.5	18.4																		
	D	8-10	8.3																		
	E	10-11.5	18.0		47	17	30														
	F	13-15	5.9																		
BH-26	A	0-2.5	22.7																		
	B	2.5-5	27.1																		
	C	5-7.5	22.5																		
	D	7.5-10	14.9	110	42	18	24	100	100	100	100	100	74	61	37	28	23.9	SC	A-2-7(1)		
	E	10-12.5	16.0																		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-26 (cont.)	F	15-17.5	29.0																		
	G	20-22.5	19.7																		
	H	25-27.5	33.7		77	41	36														
	I	30-32.5	28.5																		
	J	35-37.5	25.5																		
	K	40-42.5	18.5																		
	L	45-47.5	17.9	111	41	21	20														
	M	50-52.5	16.8																		
BH-27	A	0-2.5	16.0																		
	B	2.5-5	16.7																		
	C	5-7.5	19.0		47	18	29														
	D	7.5-10	11.5																		
	E	10-12.5	12.8																		
	F	15-17.5	20.7		55	28	27														
	G	20-22.5	16.4																		
	H	25-27.5	27.7																		
	I	30-32.5	26.9	93	70	36	34														

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.
Date: May 7, 2010
Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.
Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-27 (cont.)	J	35-37.5	20.1																		
	K	40-42.5	16.2																		
BH-28	A	0-2.5	19.9																		
	B	2.5-5	20.8																		
	C	5-7.5	13.8		45	14	31														
	D	7.5-10	11.0																		
	E	10-12.5	21.2																		
	F	15-17.5	23.0	101	77	20	57														
	G	20-22.5	22.0																		
	H	25-27.5	16.6																		
	I	30-32.5	17.1																		
	J	35-37.5	25.4		61	25	36														
	K	40-42.5	17.9																		
BH-29	A	0-2.5	20.9																		
	B	2.5-5	20.8	105																	
	C	5-7.5	16.1		44	14	30														
	D	7.5-10	10.8																		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)											Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200		USCS	AASHTO	Stress (tsf)	Strain (%)
BH-29 (cont.)	E	10-12.5	12.8																			
	F	15-17.5	18.4																			
	G	20-22.5	20.6		64	17	47															
	H	25-27.5	14.0																			
	I	30-32.5	19.2																			
	J	35-37.5	15.7																			
	K	40-42.5	23.7																			
	L	45-47.5	21.5	101	57	26	31															
	M	50-52.5	15.4																			
BH-30	A	0-1.5	20.0																			
	B	1.5-3.5	17.2																			
	C	5-6.5	18.1	108	50	19	31	100	100	100	100	100	100	89	75	59	49.9		SC	A-7-6(11)	3.1	7.6
	D	8-10	18.5																			
	E	10-11.5	18.9																			
	F	13-15	20.3		49	19	30															
BH-31	A	0-2.5	18.3																			
	B	2.5-5	17.6																			

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.
Date: May 7, 2010
Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.
Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-31 (cont.)	C	5-7.5	15.7																		
	D	7.5-10	13.6	111																3.0	2.9
	E	10-12.5	16.4		49	19	30														
	F	15-17.5	9.1																		
	G	20-22.5	12.1																		
	H	25-27.5	27.7																		
	I	30-32.5	29.6																		
	J	35-37.5	25.9		63	36	27														
	K	40-42.5	21.3																		
BH-32	A	0-1.5	19.9																		
	B	1.5-3.5	17.8		49	19	30														
	C	5-6.5	13.2																		
	D	8-10	12.8																		
	E	10-11.5	17.3																		
	F	13-15	21.5	106	55	19	36													1.7	2.9
BH-33	A	0-2.5	20.2		37	18	19														
	B	2.5-5	16.4																		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)											Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200		USCS	AASHTO	Stress (tsf)	Strain (%)
BH-33 (cont.)	C	5-7.5	20.2																			
	D	7.5-10	18.1	105	49	18	31															
	E	10-12.5	12.5																			
	F	12.5-15	10.5																			
	G	15-17.5	20.0																			
	H	20-22.5	22.7																			
	I	25-27.5	22.8		61	35	26															
	J	30-32.5	22.8																			
	K	35-37.5	24.5																			
	L	40-42.5	19.9																			
BH-34	A	0-1.5	22.6																			
	B	1.5-3.5	20.4	107																		
	C	5-6.5	20.4		49	20	29															
	D	8-10	24.5																			
	E	10-11.5	17.7																			
	F	13-15	14.2																			
	G	15-16.5	19.4		51	17	34															

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-35	A	0-1.5	23.2																		
	B	1.5-3.5	21.0		53	20	33														
	C	5-6.5	23.2																		
	D	8-10	18.0	107	41	18	23													1.0	1.7
	E	10-11.5	17.4																		
	F	13-15	8.7																		
BH-36	A	0-1.5	20.2																		
	B	1.5-3.5	22.7	103	40	14	26	100	100	100	100	86	72	47	33	26	17.8	SC	A-2-6(0)	2.0	8.2
	C	5-6.5	20.9																		
	D	8-10	23.0																		
	E	10-11.5	19.4		50	14	36														
	F	13-15	18.6																		
BH-5, 6,13, 14,19, 34	Compo-site #1	0-5	15.9		48	15	33	100	100	100	100	100	100	92	85	77	73.4	CL	A-7-6(23)		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

SUMMARY OF LABORATORY TEST RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (% Moisture)			Sieve Analysis (% Passing)										Soil Classification		Unconfined Compression Test	
					LL	PL	PI	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#10	#40	#100	#200	USCS	AASHTO	Stress (tsf)	Strain (%)
BH-24, 25,30, 32,35, 36	Compo-site #2	0-5	19.1		49	19	30	100	100	100	100	100	100	100	93	87	85.1	CL	A-7-6(26)		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

CORROSION TESTING RESULTS

Client: Burns & McDonnell Engineering Company, Inc.

Date: May 7, 2010

Project: Ft. Sill AIT Barracks, Lawton, Oklahoma.

Project No.: 7310-3184

Boring No.	Sample I.D.	Depth (ft.)	Soil Description	Resistivity (Ohms-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)	Redox Potential (mV)
BH-5, 6, 13,14,19,34	Composite #1	0-5	Dark Gray, Dark Brown & Brown Clay with Sand	879	8.0	120	111	200
BH-24,25, 30,32,35,36	Composite #2	0-5	Dark Gray, Dark Brown & Brown Clay	1047	8.2	140	20	251

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

MODIFIED PROCTOR TEST EVALUATION

Project: Ft. Sill AIT Barracks
Lawton, Oklahoma

Sample: **BH-5,6,13,14,19,34 - Composite #1**
Test Method: ASTM D1557
Project No.: 7310-3184

Test Sequence # =	1	2	3	4	5
DD, pcf =	115.3	117.1	116.7	112.6	111.3
M, % =	7.6	9.8	11.5	13.6	5.4
Specific Gravity =	2.70 (estimated)				

Results:

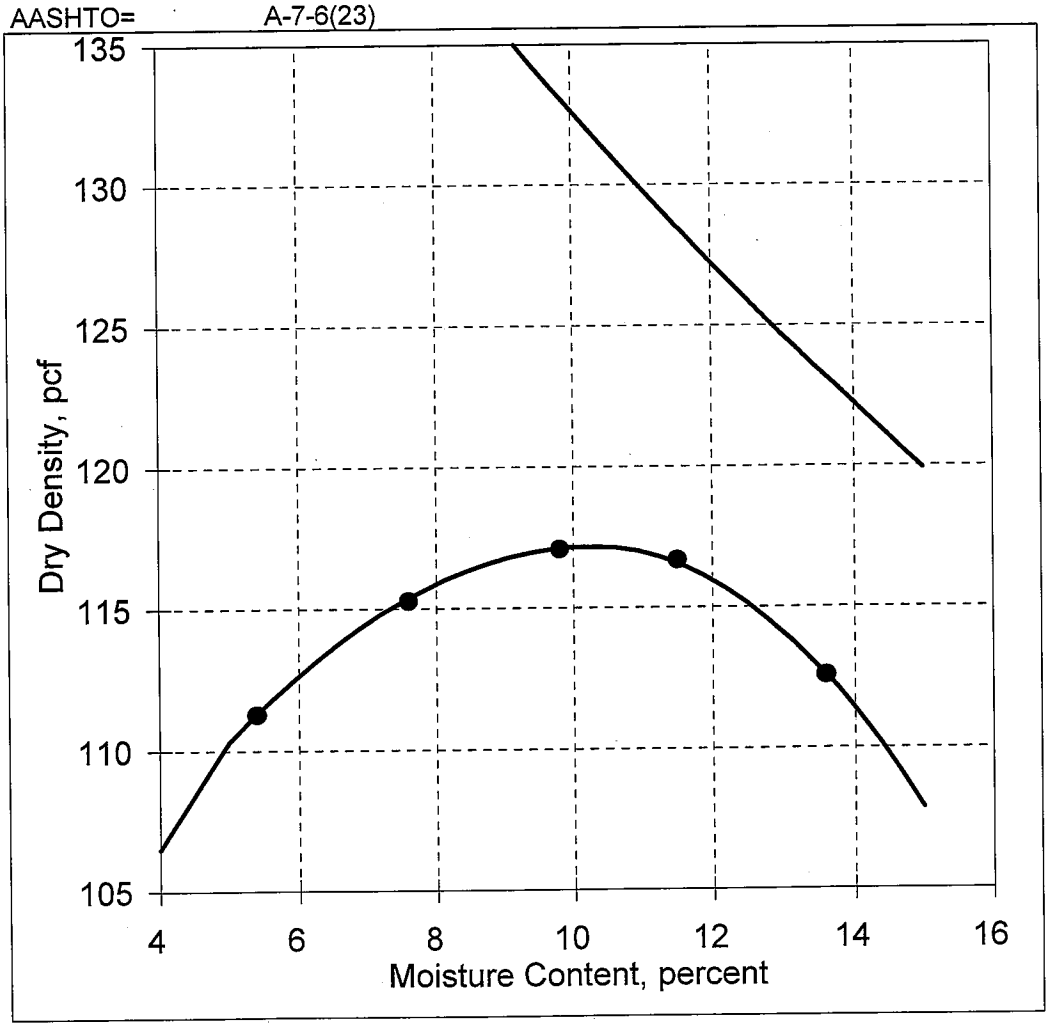
Maximum Dry Density =	**117.2 pcf**
Optimum Moisture =	**10.3 %**

Description: Dark Gray, Dark Brown & Brown Clay with Sand

Sieve=	#4	#10	#40	#200
% Passing=	100	92	85	76.9

LL=48 PL=15 PI=33

USCS= CL
AASHTO= A-7-6(23)



STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

MODIFIED PROCTOR TEST EVALUATION

Project: Ft. Sill AIT Barracks
Lawton, Oklahoma

Sample: **BH-24,25,30,32,35,36 - Composite #2**
Test Method: ASTM D1557
Project No.: 7310-3184

Test Sequence # =	1	2	3	4	5
DD, pcf =	112.1	114.4	115.3	114.2	110.5
M, % =	6.8	9.0	10.5	12.4	14.8
Specific Gravity =	2.70 (estimated)				

Results:

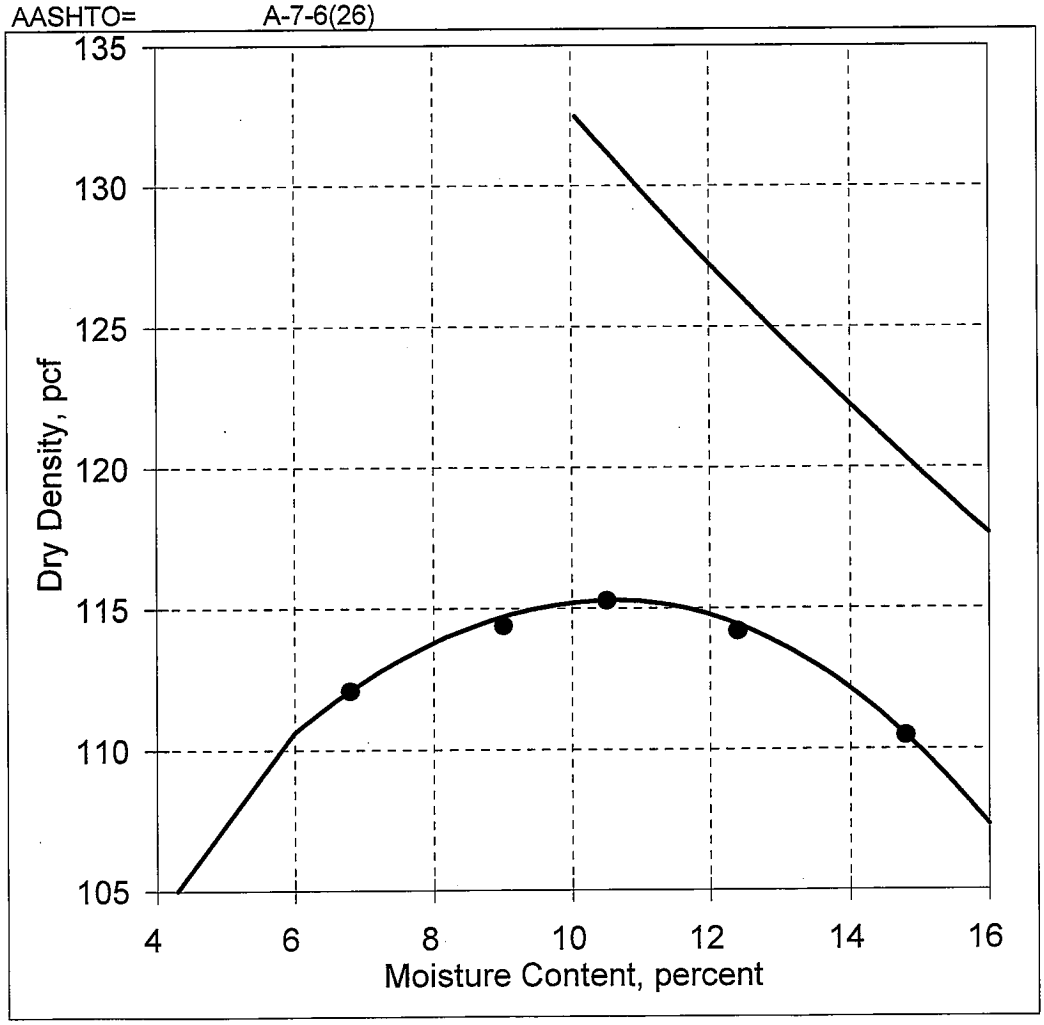
Maximum Dry Density =	**115.3 pcf**
Optimum Moisture =	**10.6 %**

Description: Dark Gray, Dark Brown & Brown Clay

Sieve=	#4	#10	#40	#200
% Passing=	100	93	87	85.1

LL=49 PL=19 PI=30

USCS= CL
AASHTO= A-7-6(26)



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

CORPORATE OFFICE and CENTRAL LABORATORY
3400 N. Lincoln Blvd., Oklahoma City, OK 73105 (405) 528-0541
CA77 Exp. 06/30/07

Area Offices

5358 S. 125th E. Ave., Ste. B	Tulsa, OK 74146	(918) 459-2700
902 Trails West Loop	Enid, OK 73703	(580) 237-3130
202 SE "J" Ave.	Lawton, OK 73501	(580) 353-0872

Acc. No: 0230BUR20 Project No.: 7310-3184

		Date Sampled:	3/23&25&30, 2010
Report Date:	05/07/10	Sampled By:	Johnny Jarman
Project:	Ft. Sill AIT Barracks	By Order Of:	
Location:	Lawton, Oklahoma	Order No.:	
Arch./Engr.:		Quantity:	
Contractor:	Burns & McDonnell Engineering Company, Inc.	Represented:	Composite #1
REPORT:	CALIFORNIA BEARING RATIO	Sample No:	BH-5,6,13,14,19,34
Specification:	Project Specs.	Test Method:	ASTM D1883

TEST RESULTS

Soil Description: Dark Gray, Dark Brown & Brown Clay with Sand

Density as Molded, Lbs./Cu.Ft.	126.2
Moisture content of Sample as Molded, Percent	10.9
Dry Density as Molded, Lbs./Cu.Ft.	113.8
Dry Density after Soaking, Lbs./Cu.Ft.	110.4
Average Moisture Content after Soaking, Percent	16.2
Moisture Content in Top "1" inch, Percent	22.1
Soaking Time, Days	4.0
Swell, Percent	3.1

Bearing Ratio as % of Standard

Penetration Inches	CBR Values
0.1	3.1
0.2	2.4
0.3	2.2
0.4	2.1

Nominal CBR Value:	3.1	Target Density Method:	ASTM D1557
Surcharge Weight, Lbs.:	9.991	Max. Density, lbs./cu.ft.	117.2
Method of Compaction:	ASTM D1883	Optimum Moisture, %	10.4

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

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Area Offices

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Acc. No: 0230BUR20 Project No.: 7310-3184

		Date Sampled:	3/23&25&30, 2010
Report Date:	05/07/10	Sampled By:	Johnny Jarman
Project:	Ft. Sill AIT Barracks	By Order Of:	
Location:	Lawton, Oklahoma	Order No.:	
Arch./Engr.:		Quantity:	
Contractor:	Burns & McDonnell Engineering Company, Inc.	Represented:	Composite #2
REPORT:	CALIFORNIA BEARING RATIO	Sample No:	BH-24,25,30,32,35,36
Specification:	Project Specs.	Test Method:	ASTM D1883

TEST RESULTS

Soil Description: Dark Gray, Dark Brown & Brown Clay

Density as Molded, Lbs./Cu.Ft.	128.3
Moisture content of Sample as Molded, Percent	11.2
Dry Density as Molded, Lbs./Cu.Ft.	115.3
Dry Density after Soaking, Lbs./Cu.Ft.	111.8
Average Moisture Content after Soaking, Percent	15.2
Moisture Content in Top "1" inch, Percent	19.5
Soaking Time, Days	4.0
Swell, Percent	3.2

Bearing Ratio as % of Standard

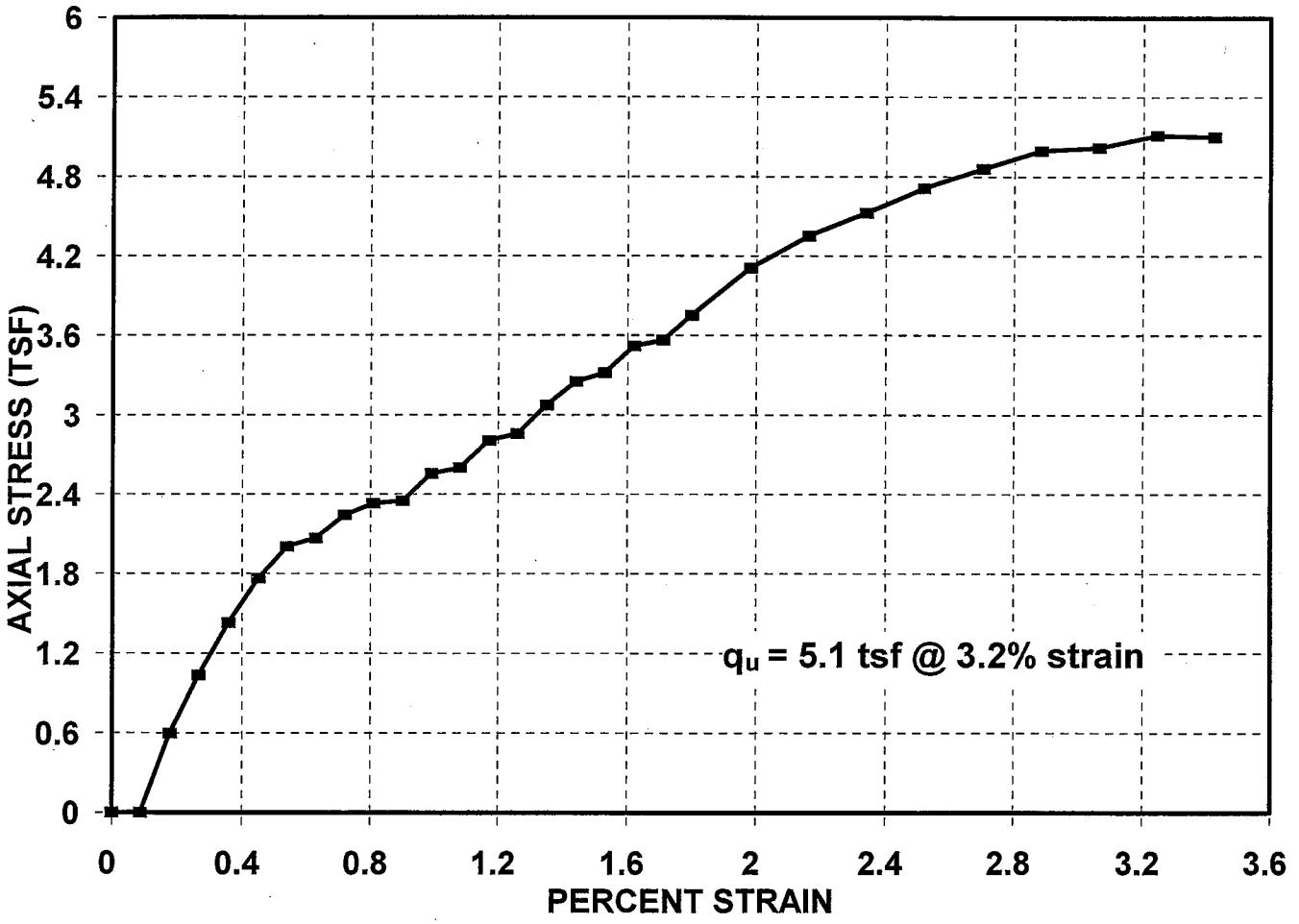
Penetration Inches	CBR Values
0.1	3.5
0.2	2.9
0.3	2.7
0.4	2.6

Nominal CBR Value:	3.5	Target Density Method:	ASTM D1557
Surcharge Weight, Lbs.:	9.991	Max. Density, lbs./cu.ft.	115.3
Method of Compaction:	ASTM D1883	Optimum Moisture, %	10.6

STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-4, Depth: 7.5-10 ft.

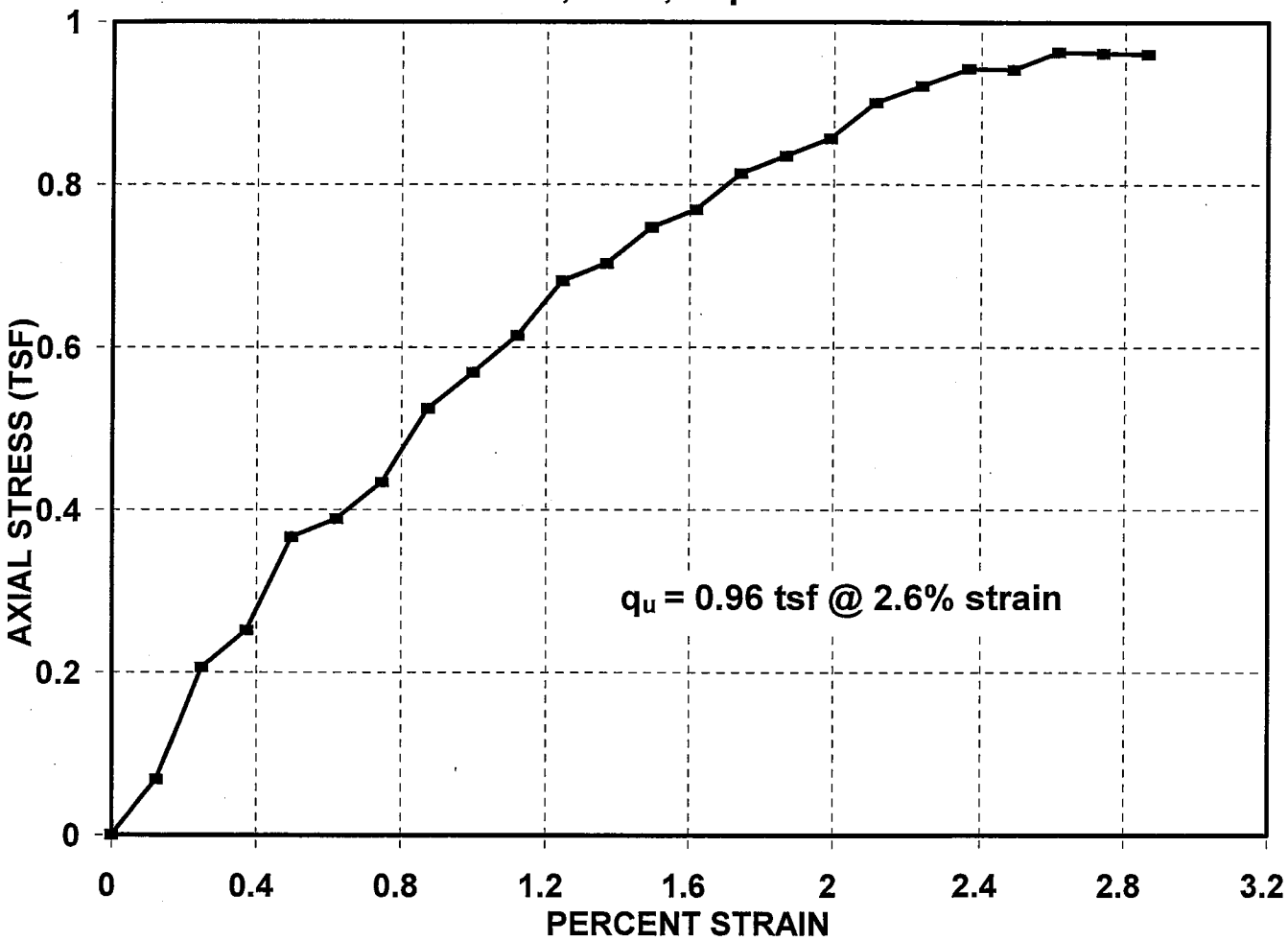


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-8, Depth: 37.5-38 ft.

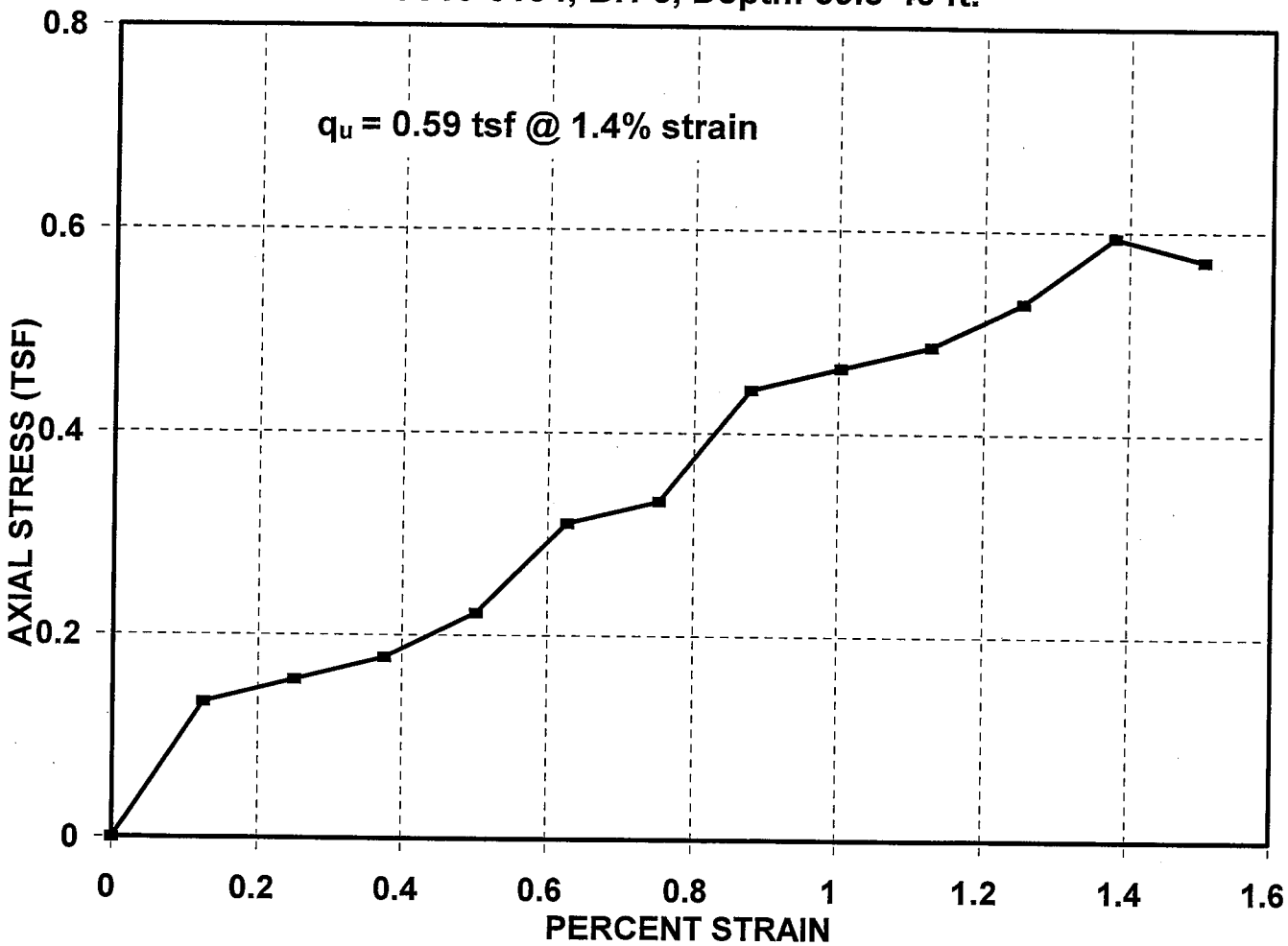


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-8, Depth: 39.5-40 ft.

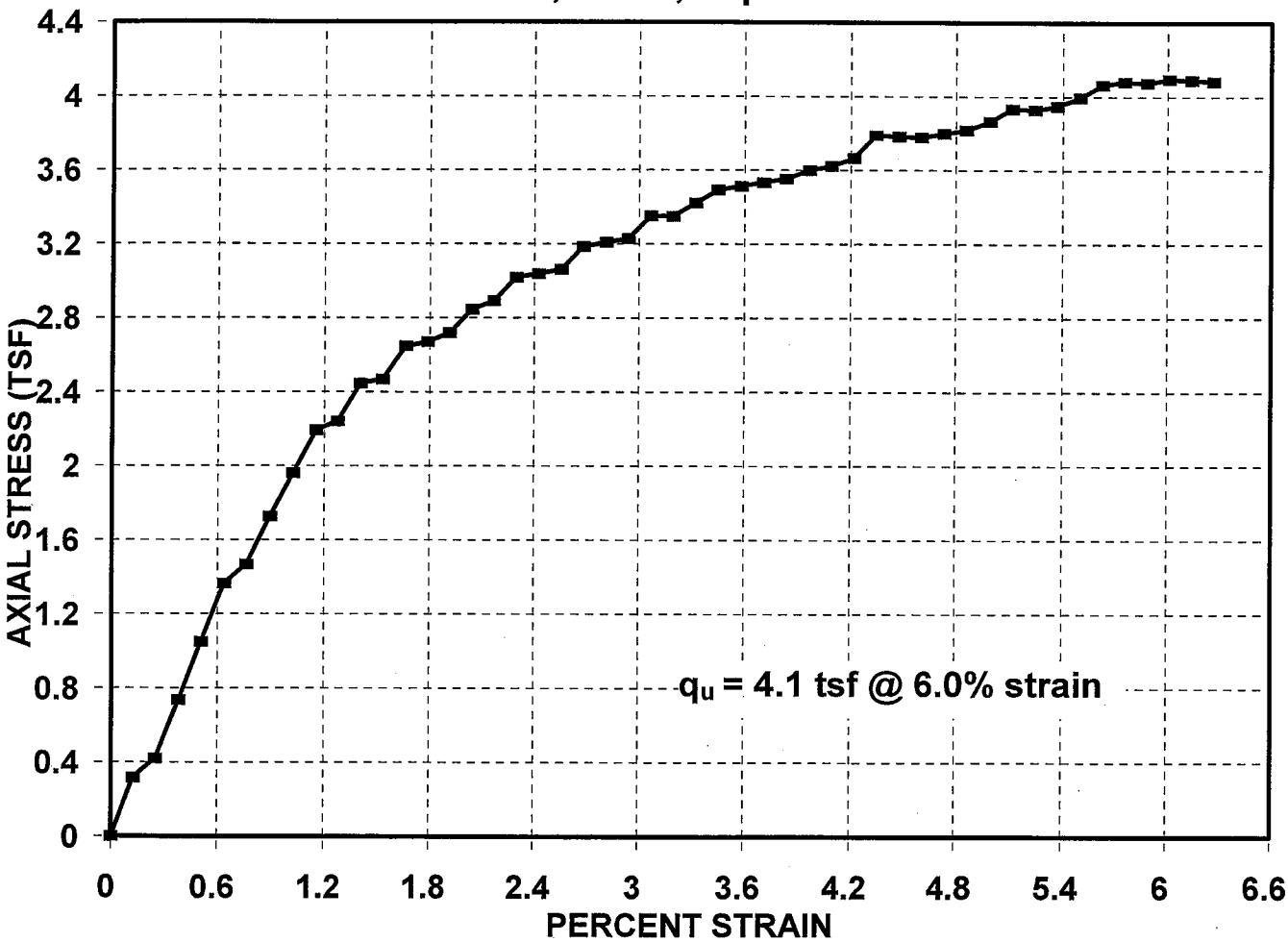


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-12, Depth: 39.5-40 ft.

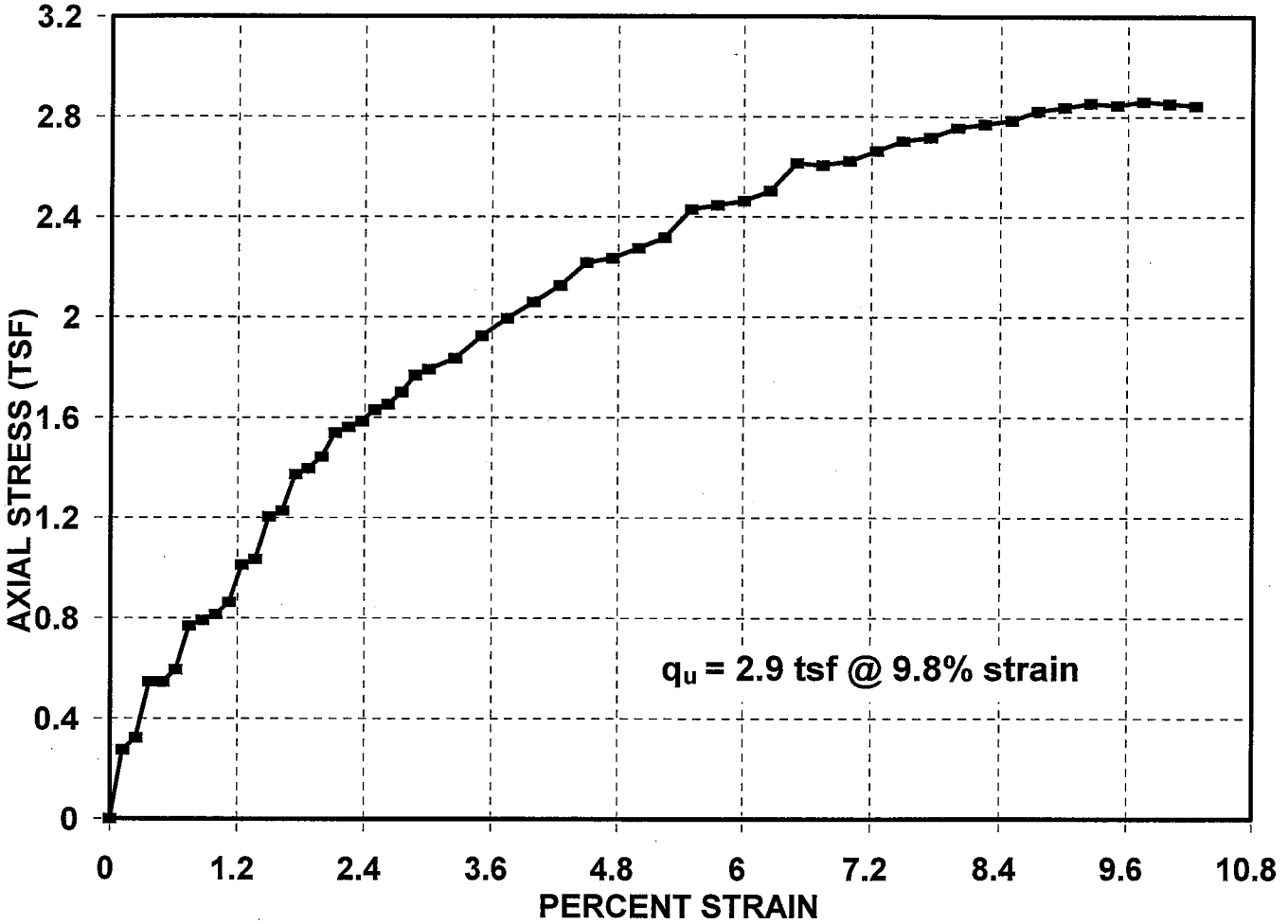


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-12, Depth: 40-40.5 ft.

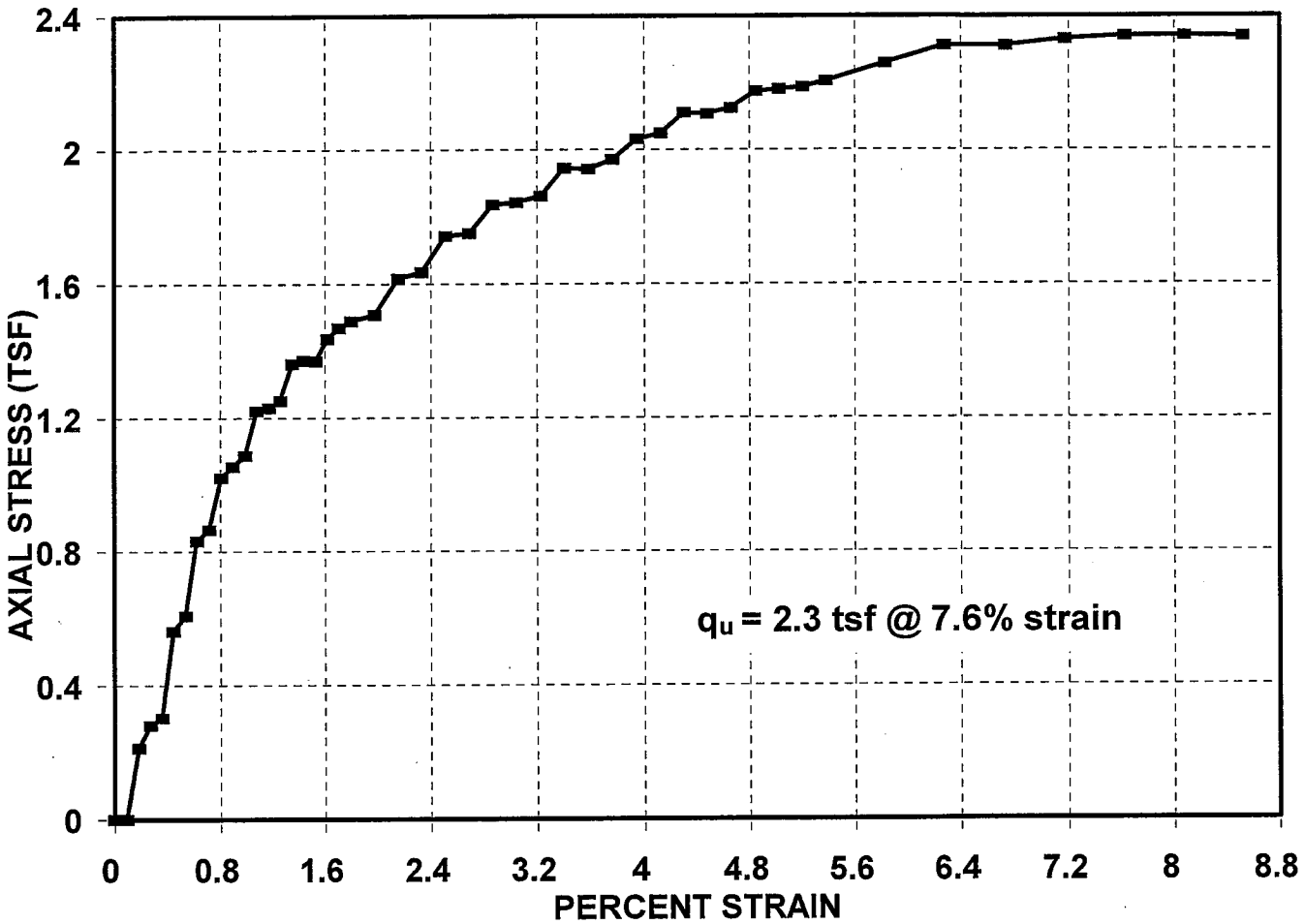


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-14, Depth: 1.5-3.5 ft.

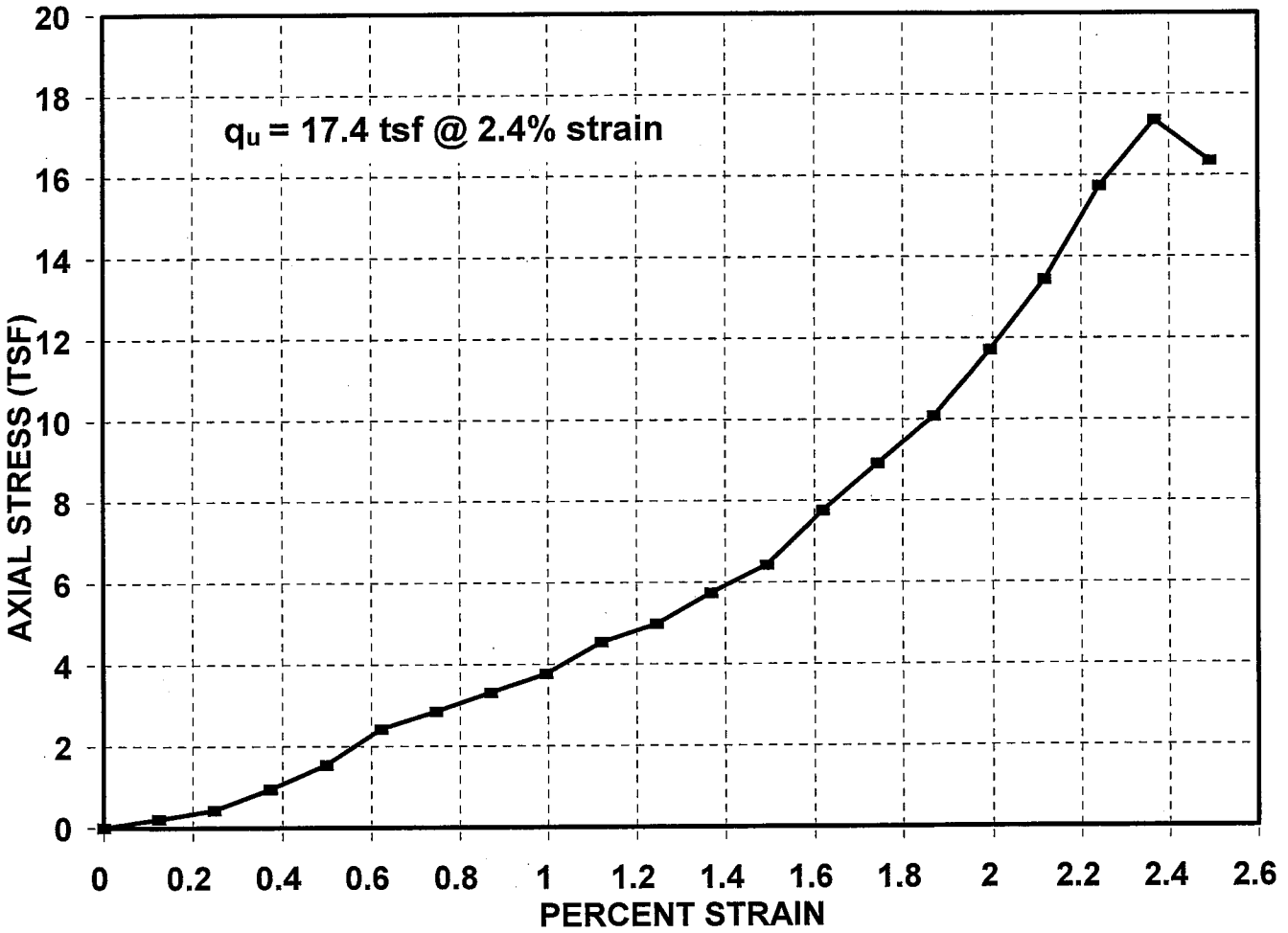


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-15, Depth: 36.5-37 ft.

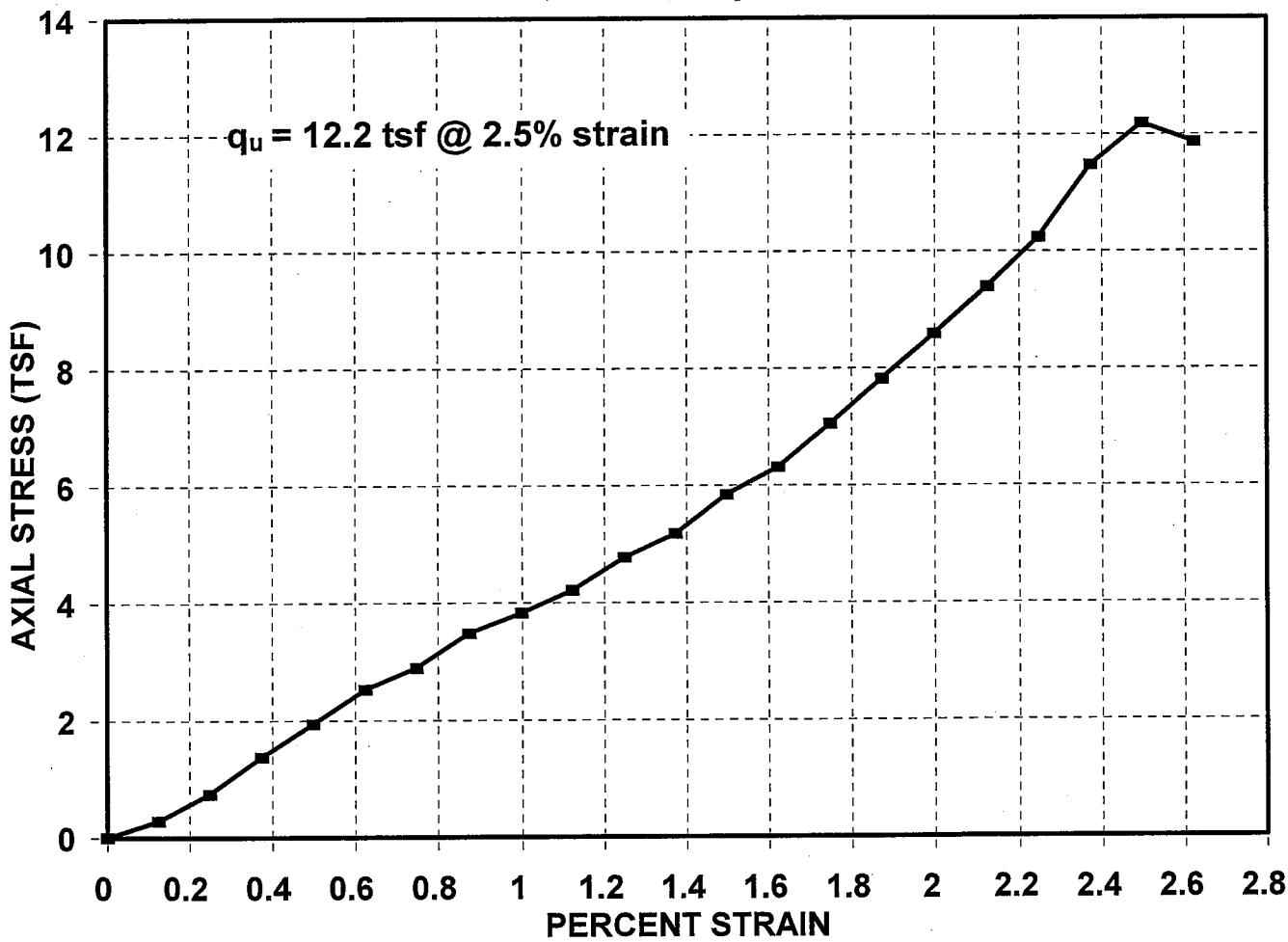


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

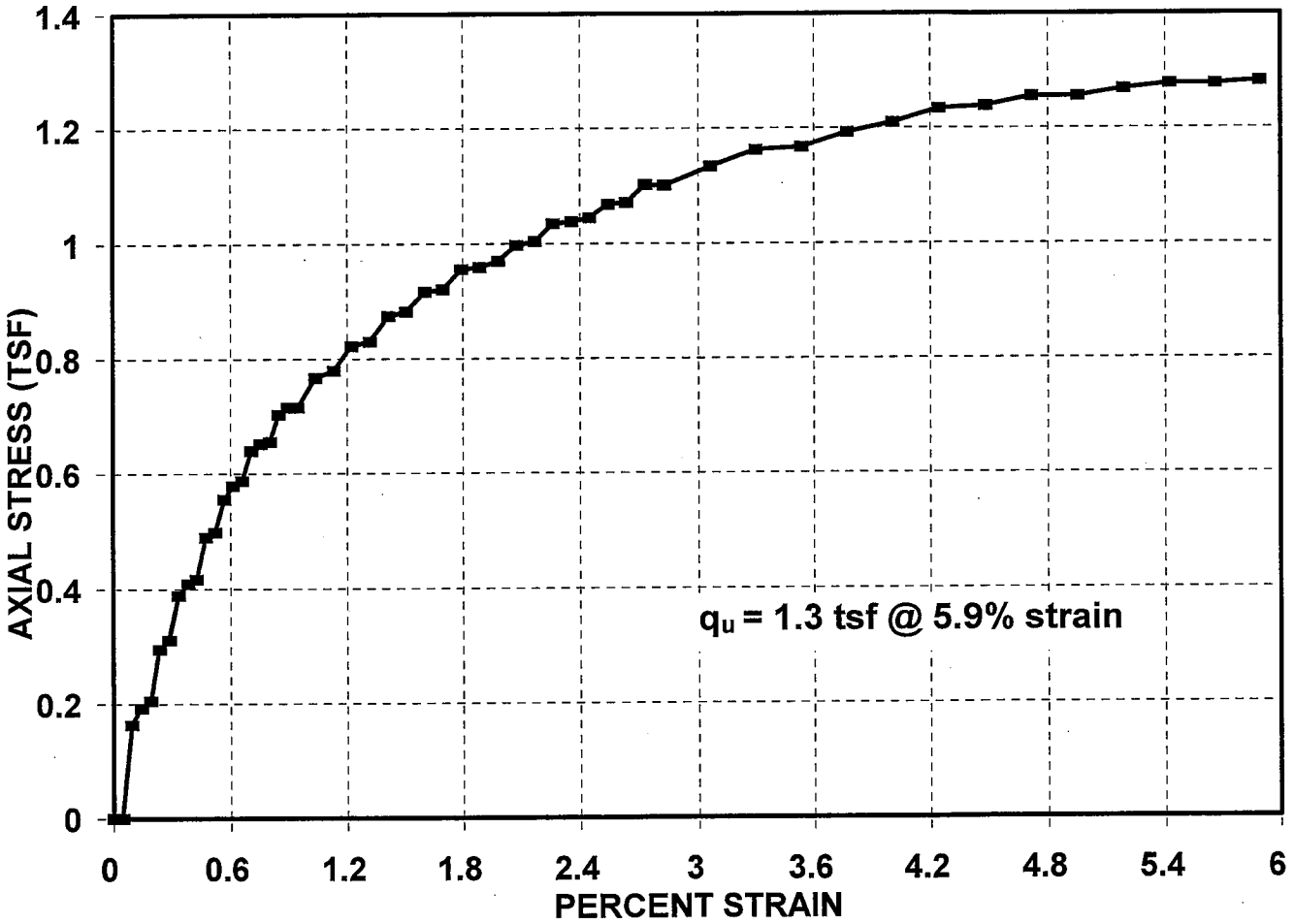
7310-3184, BH-15, Depth: 39-39.5 ft.



STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-17, Depth: 5-7.5 ft.

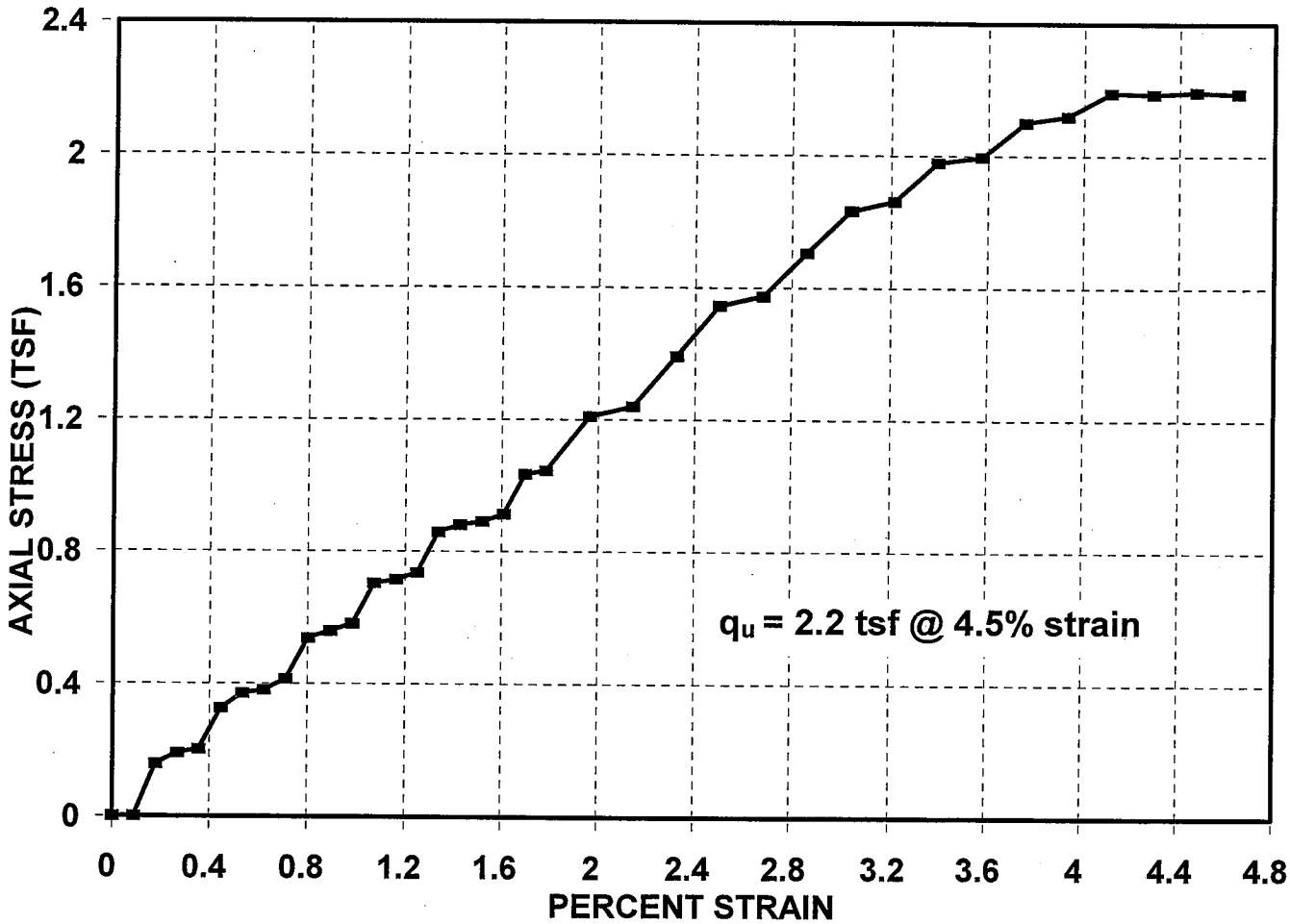


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-19, Depth: 13-15 ft.

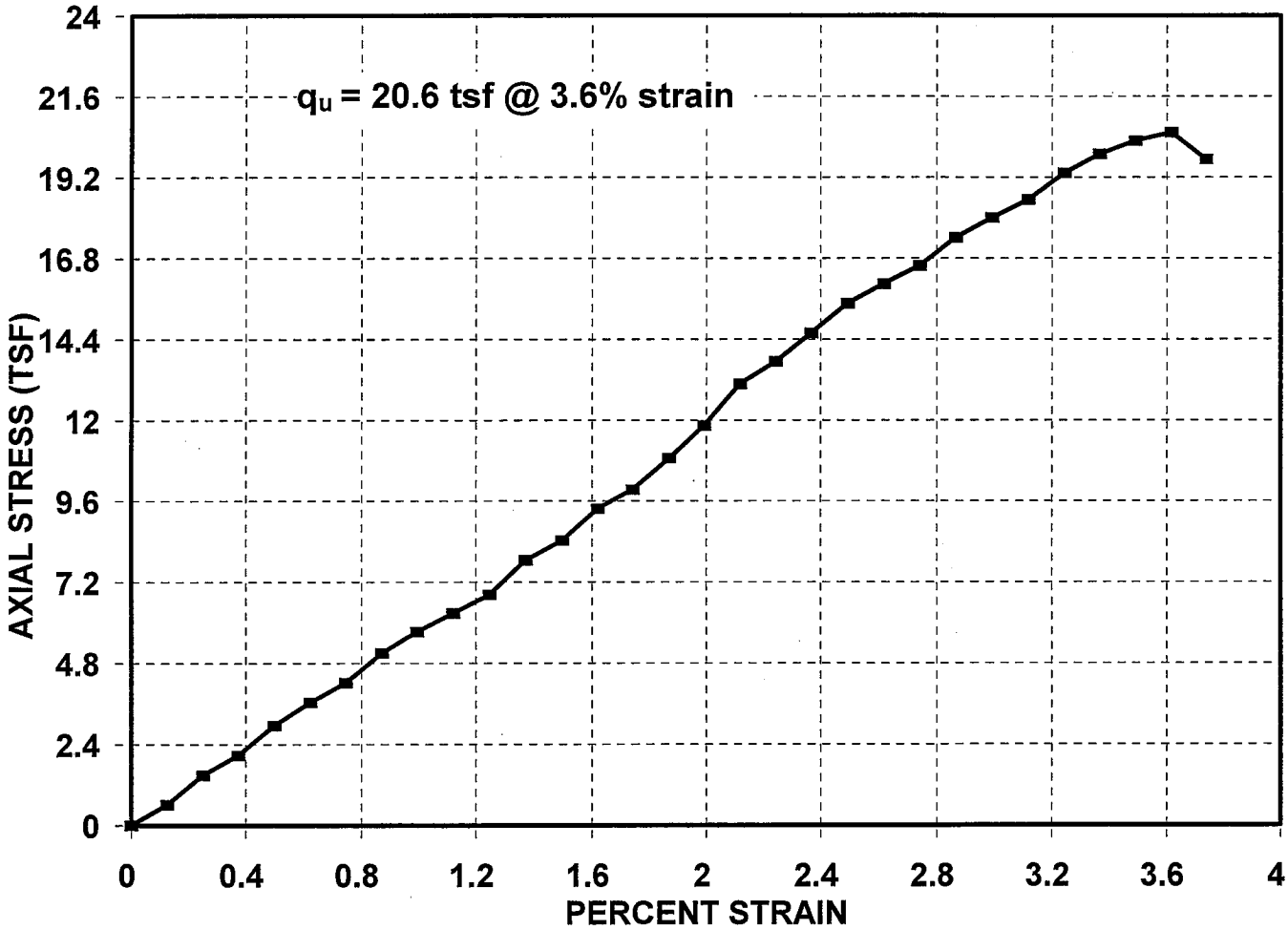


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-21, Depth: 36-36.5 ft.



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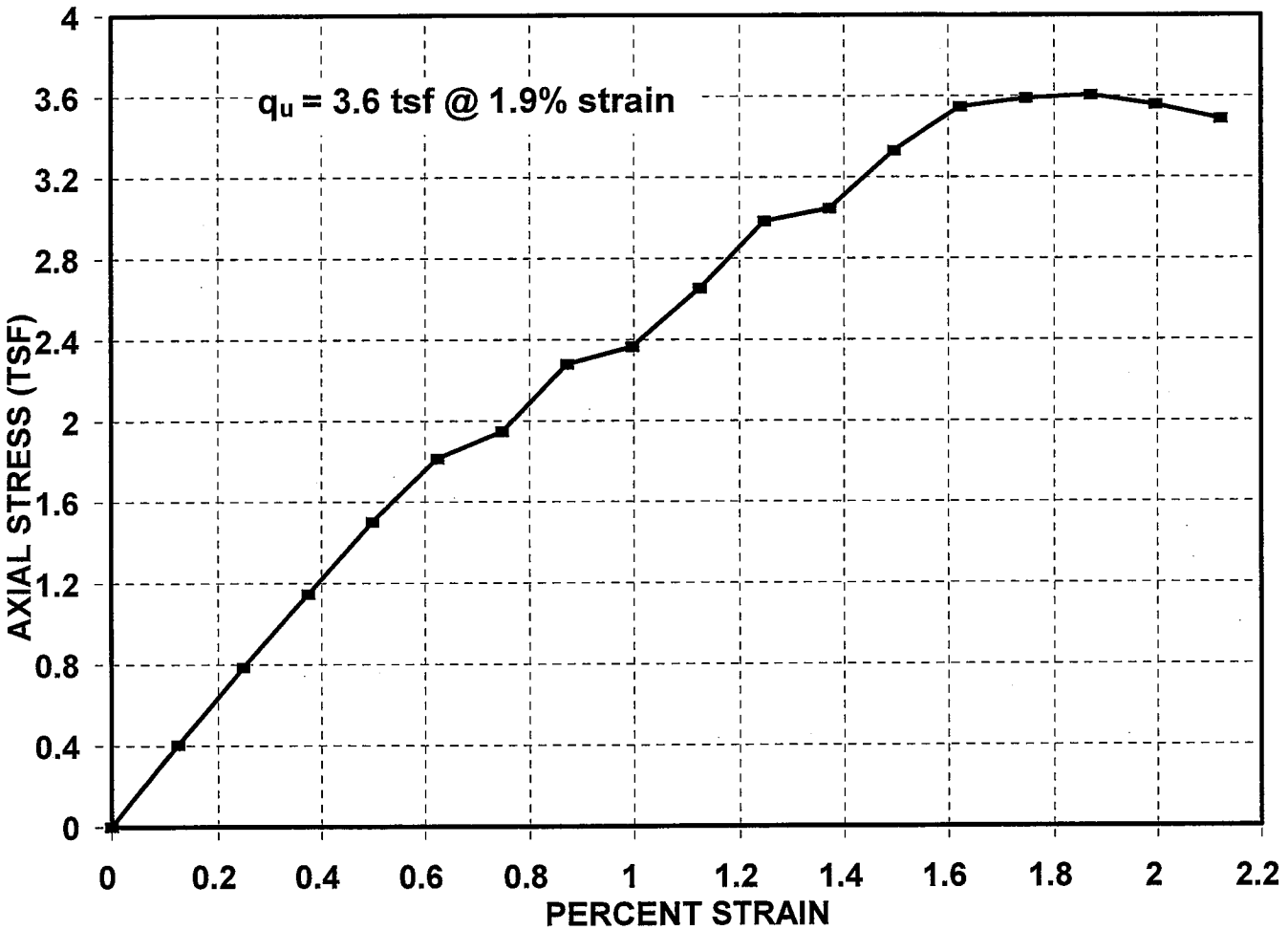
GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-21, Depth: 36.5-37 ft.

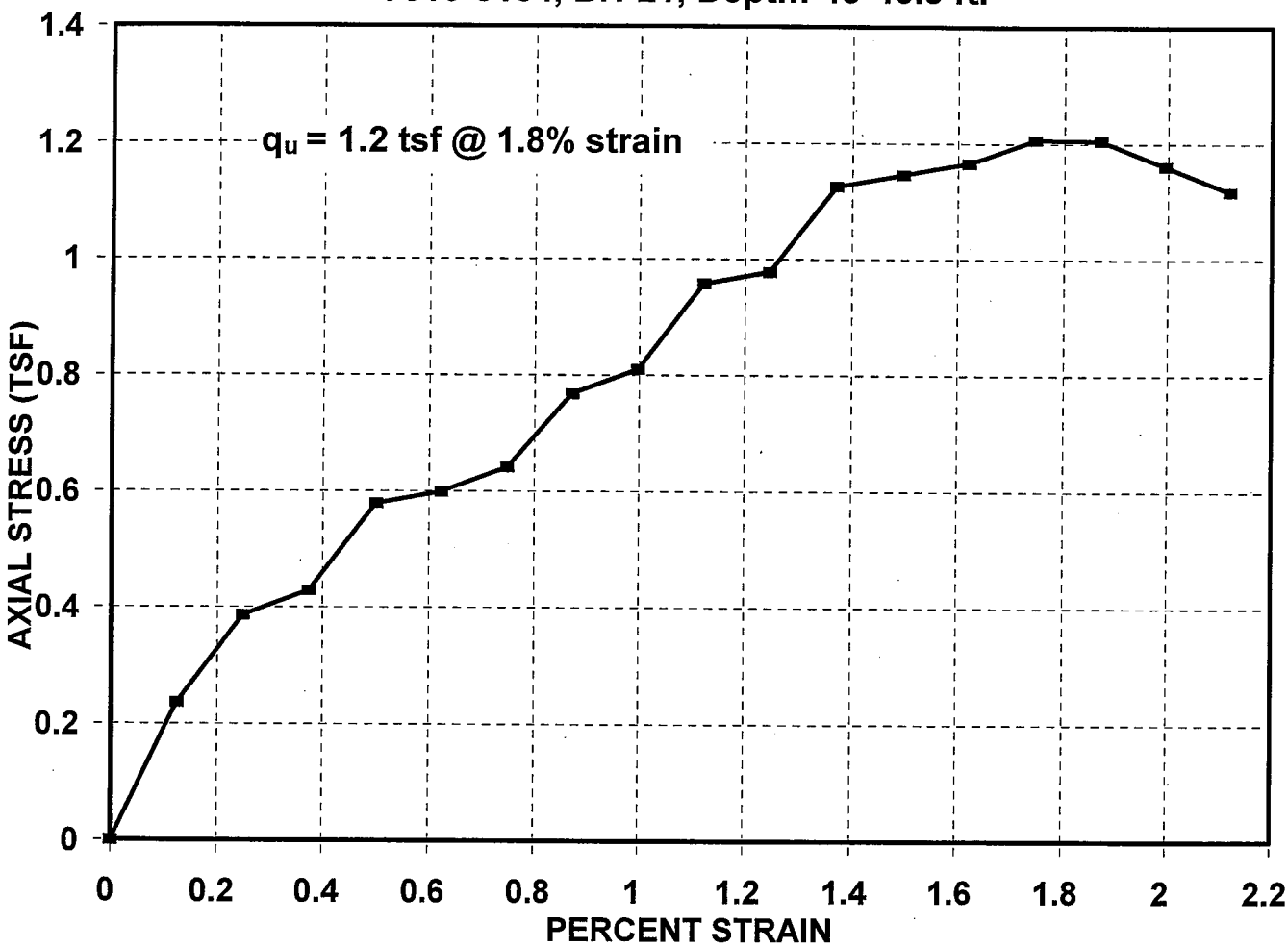


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-21, Depth: 40-40.5 ft.

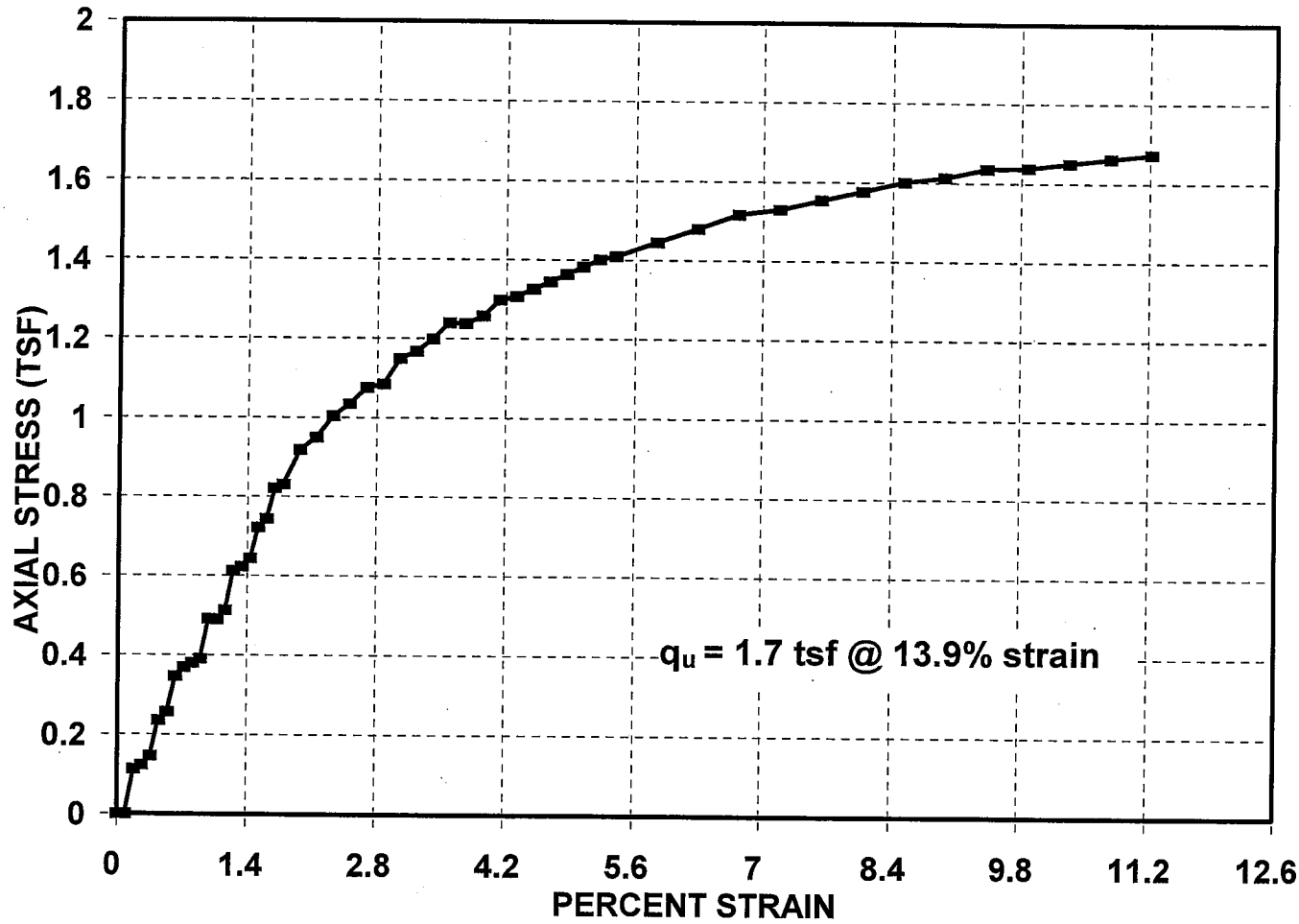


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-23, Depth: 2.5-5 ft.

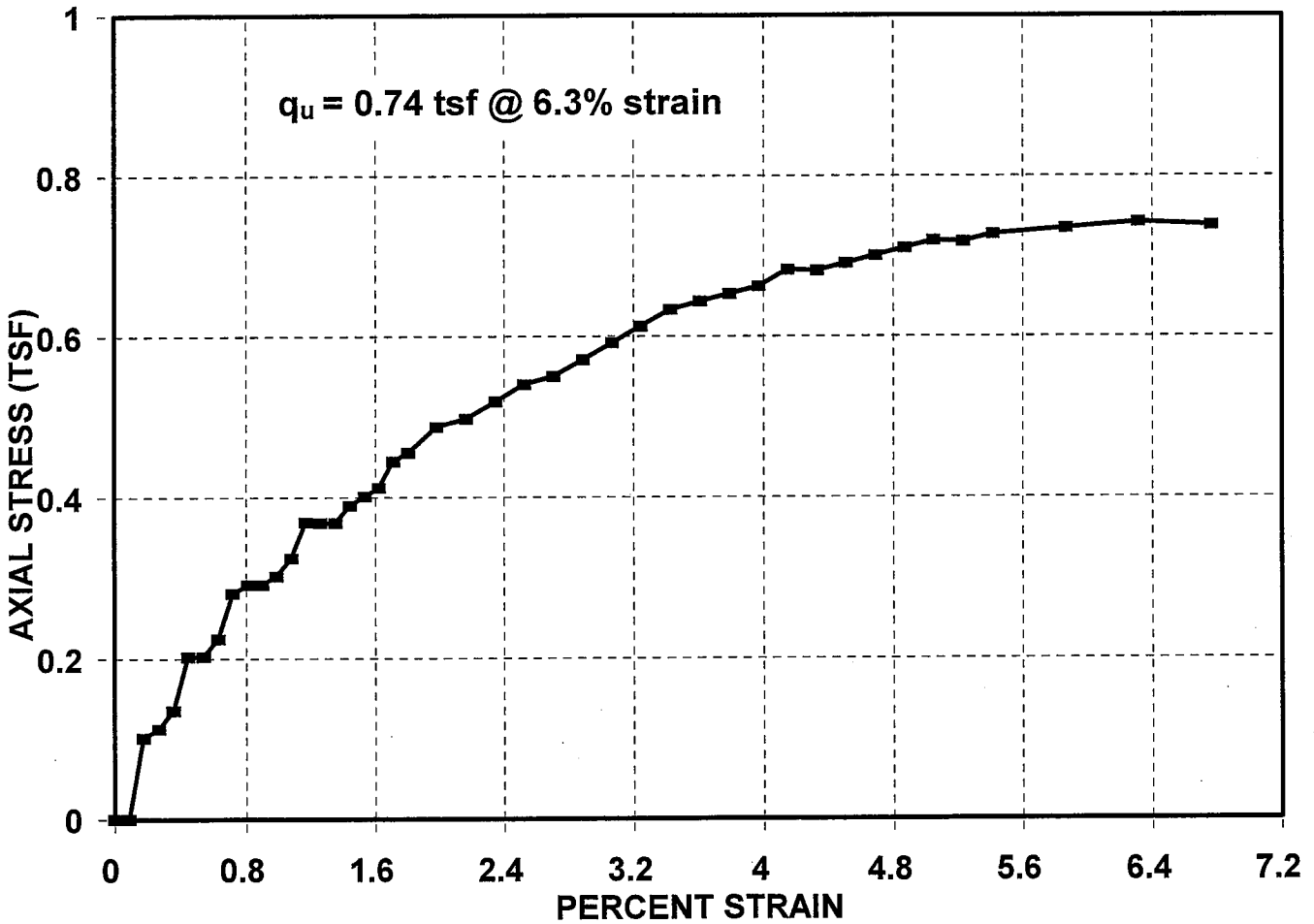


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-24, Depth: 1.5-3.5 ft.

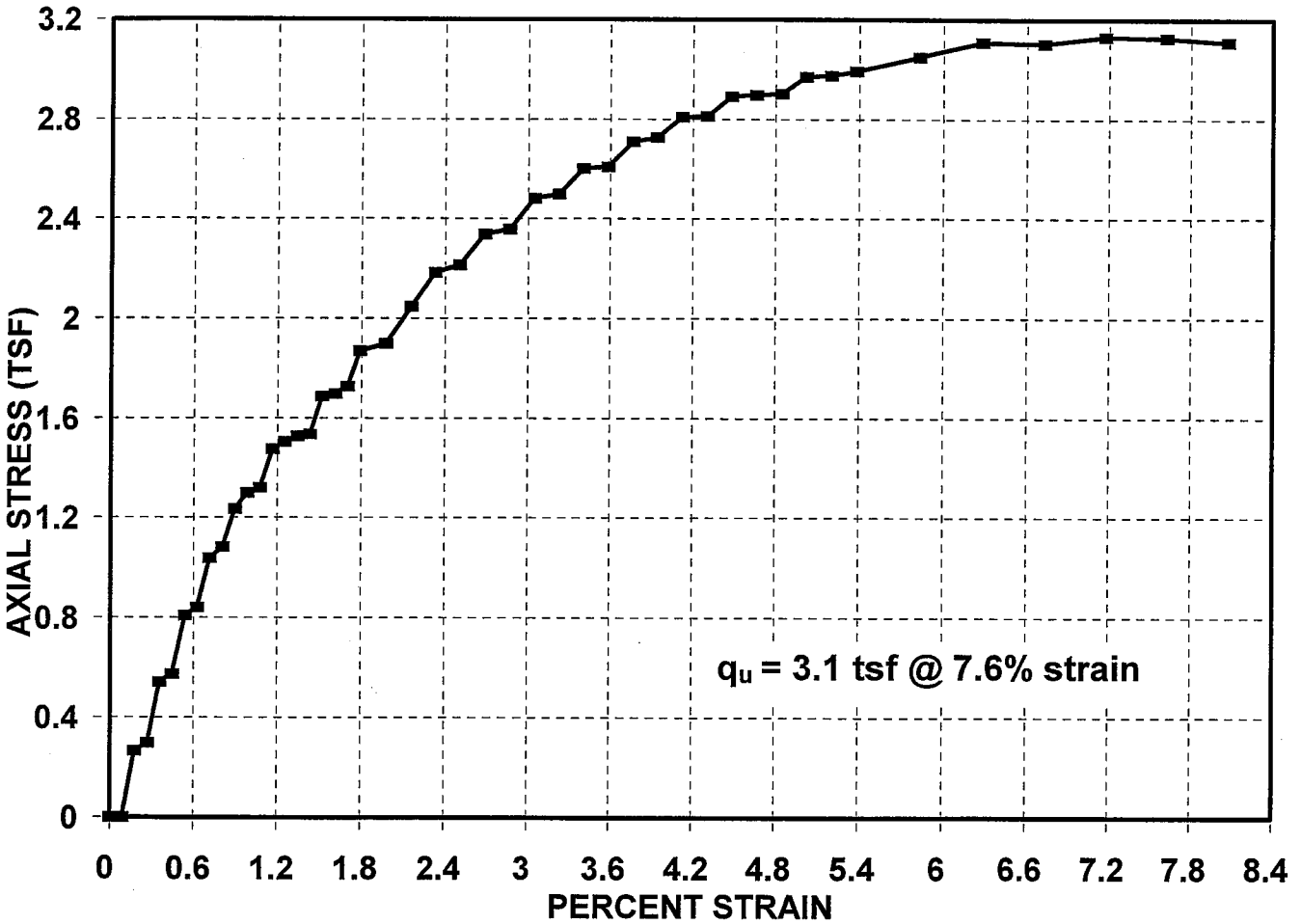


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-30, Depth: 5-6.5 ft.



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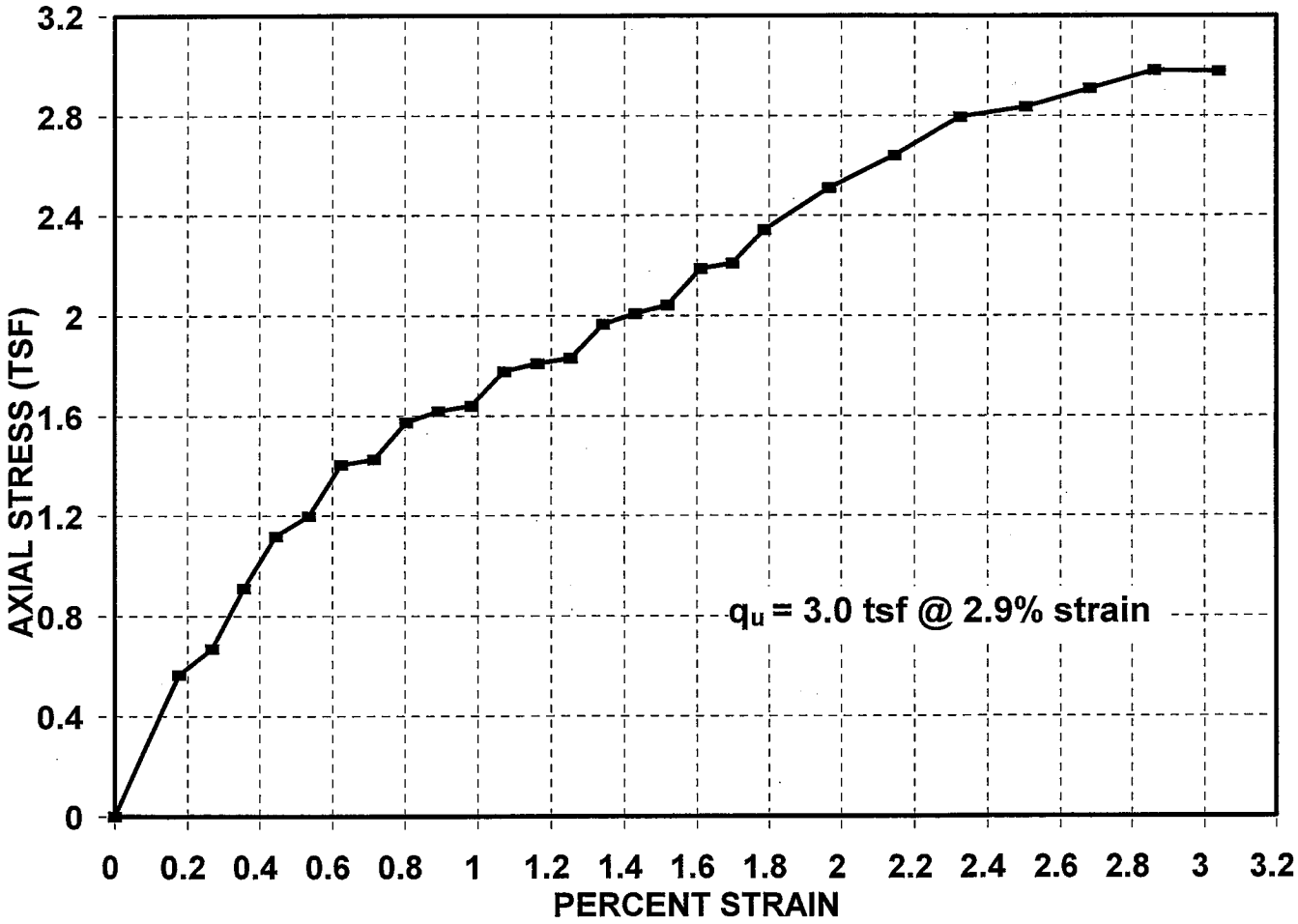
GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-31, Depth: 7.5-10 ft.

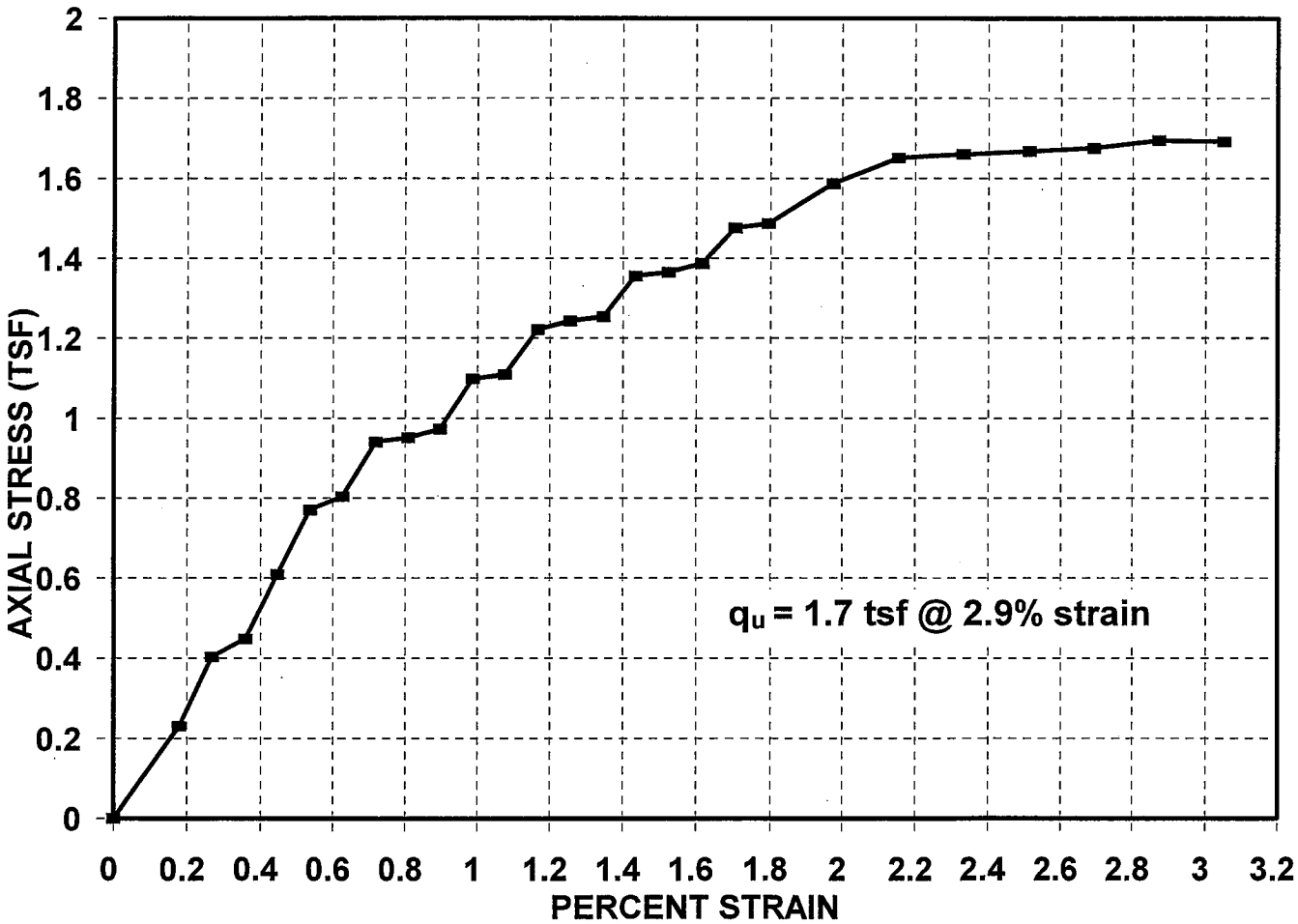


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-32, Depth: 13-15 ft.



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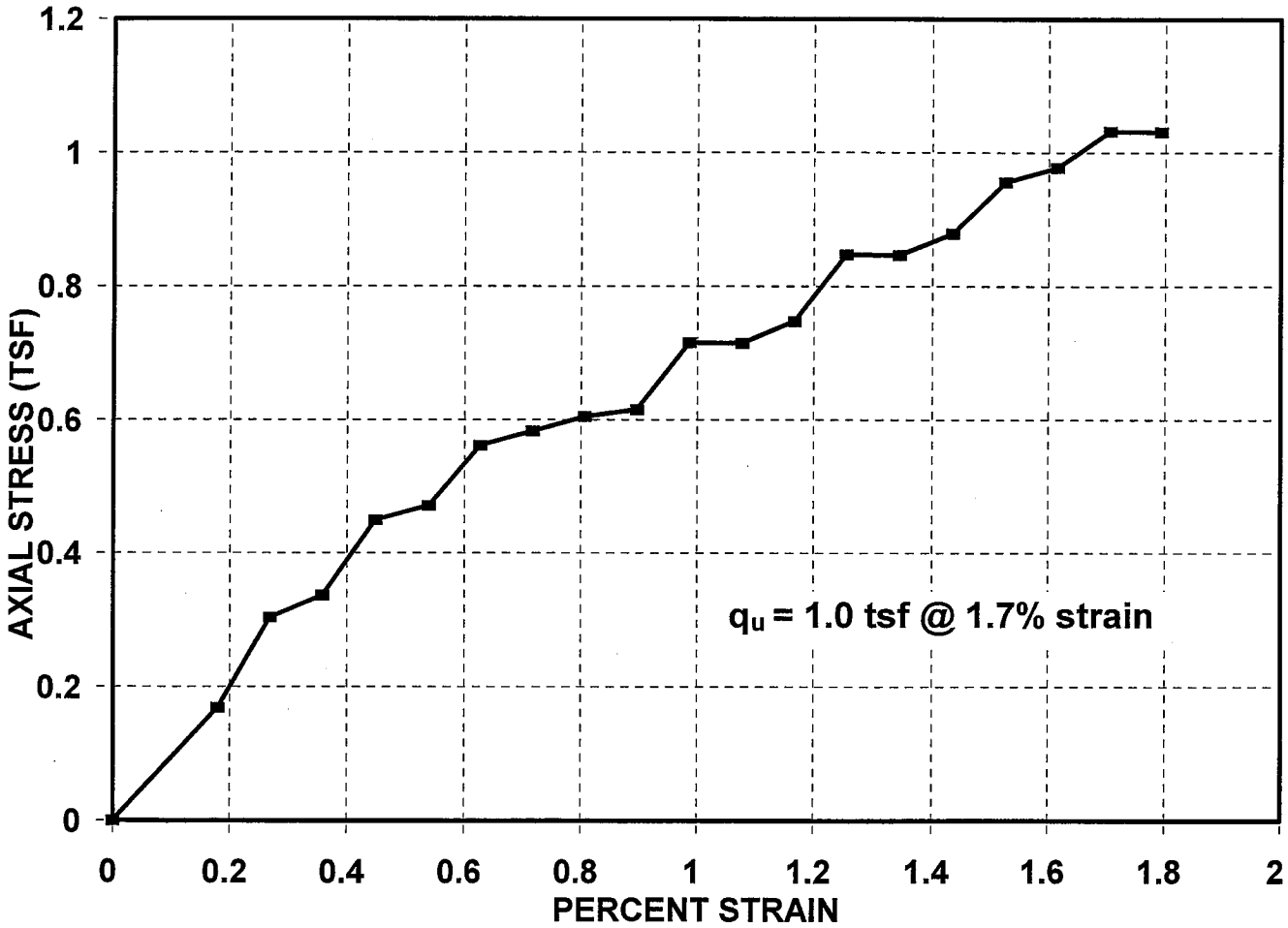
GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

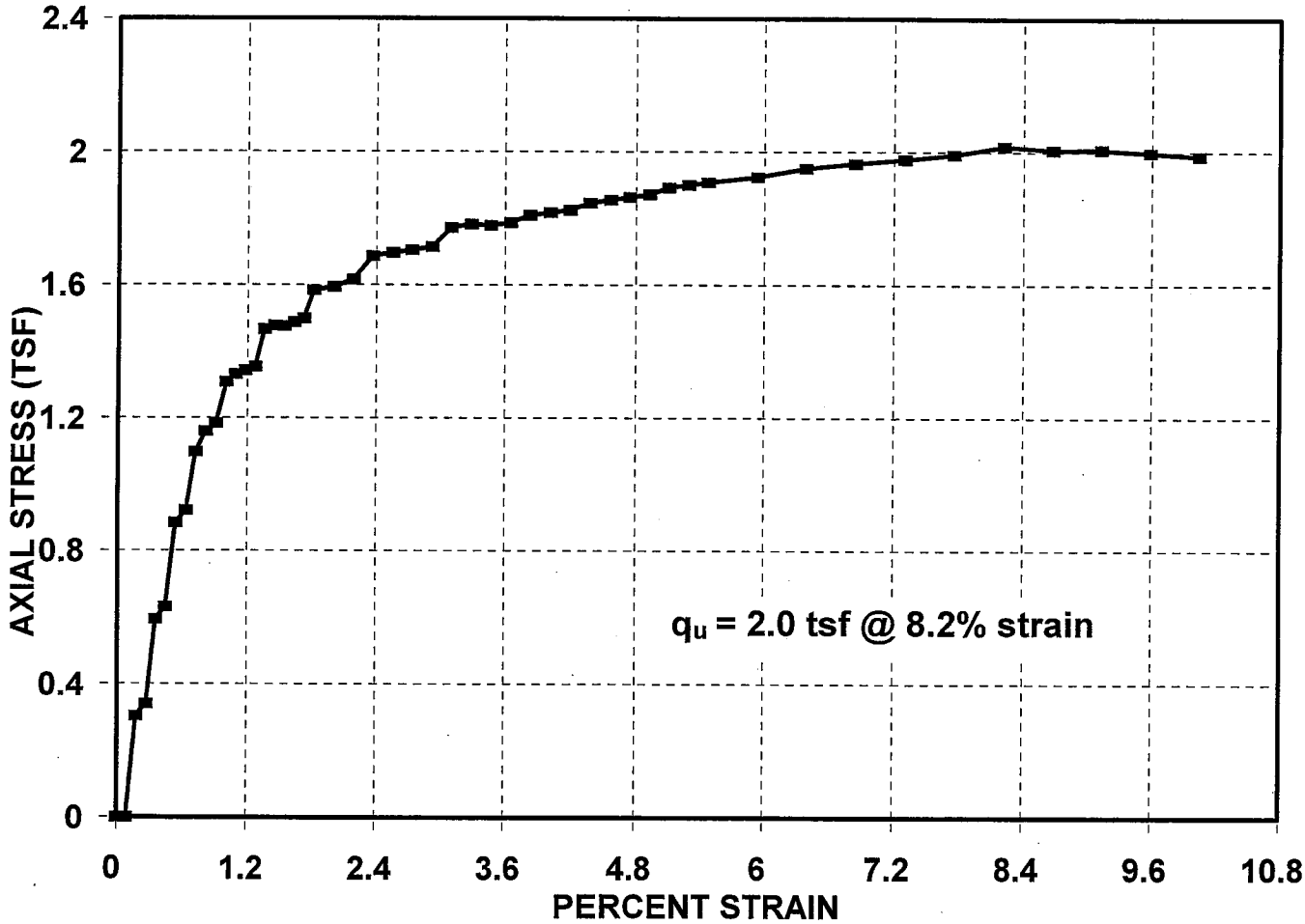
7310-3184, BH-35, Depth: 8-10 ft.



STANDARD TESTING AND ENGINEERING COMPANY GEOTECHNICAL SERVICES

UNCONFINED COMPRESSION TEST

7310-3184, BH-36, Depth: 1.5-3.5 ft.

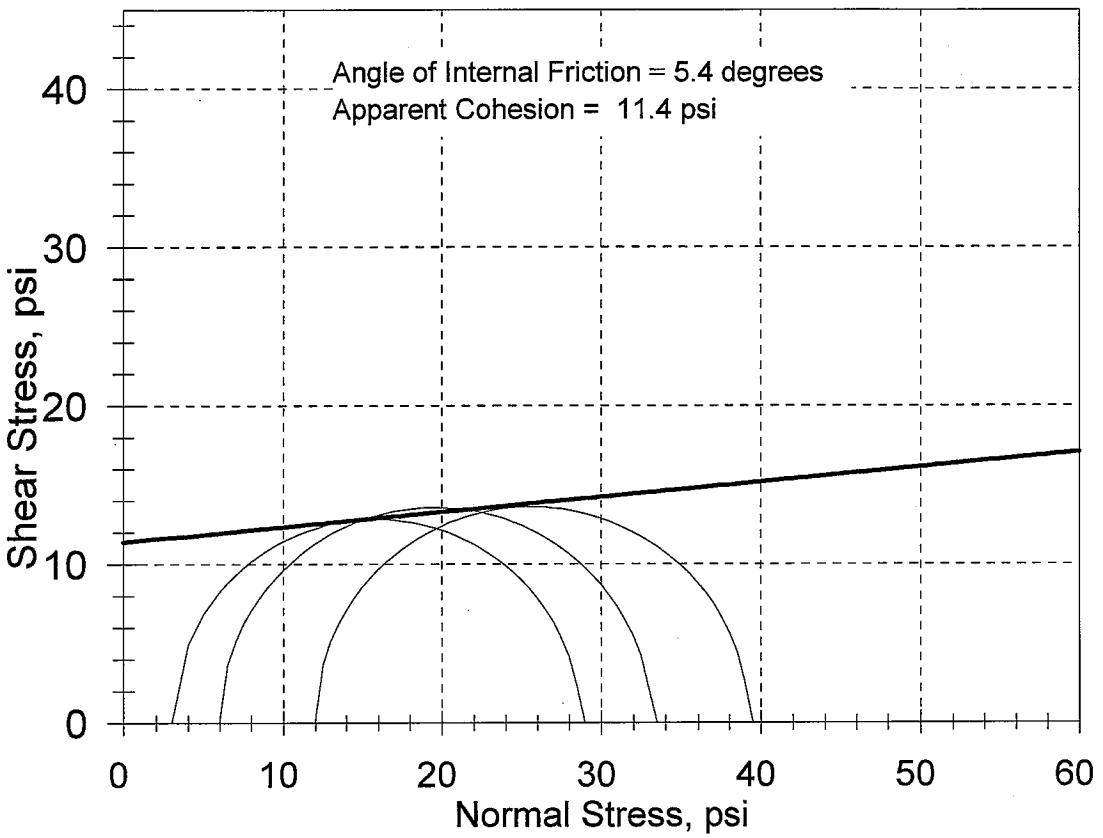


STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

Triaxial Compression Test Results

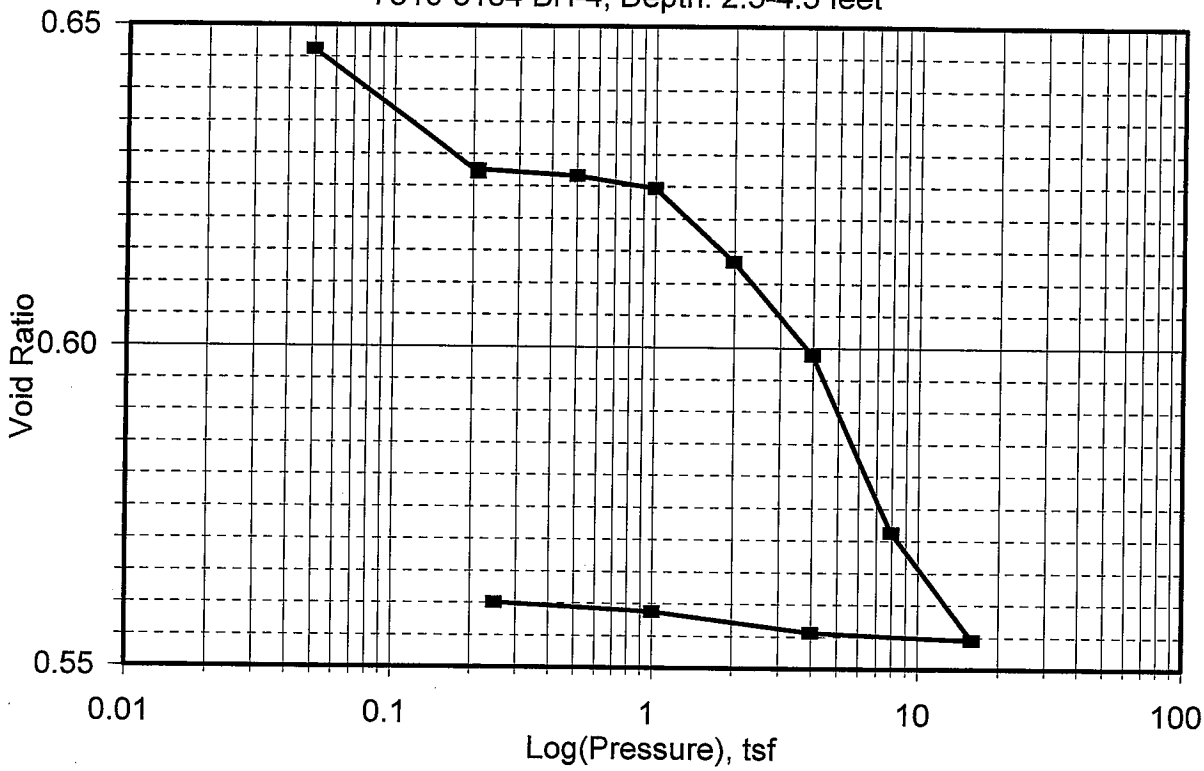
7310-3184, BH-34 @ 1.5-3.5 ft.



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

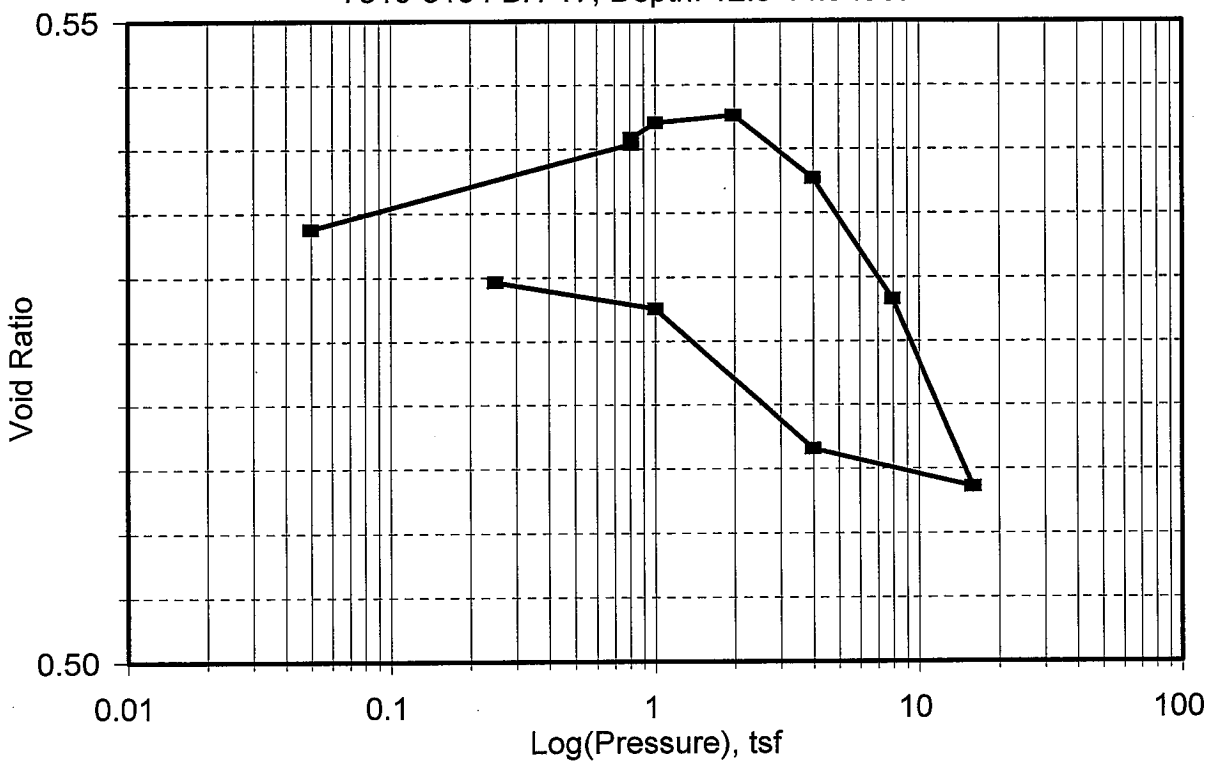
Consolidation Curve
Void Ratio versus Log (Pressure)
7310-3184 BH-4, Depth: 2.5-4.5 feet



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

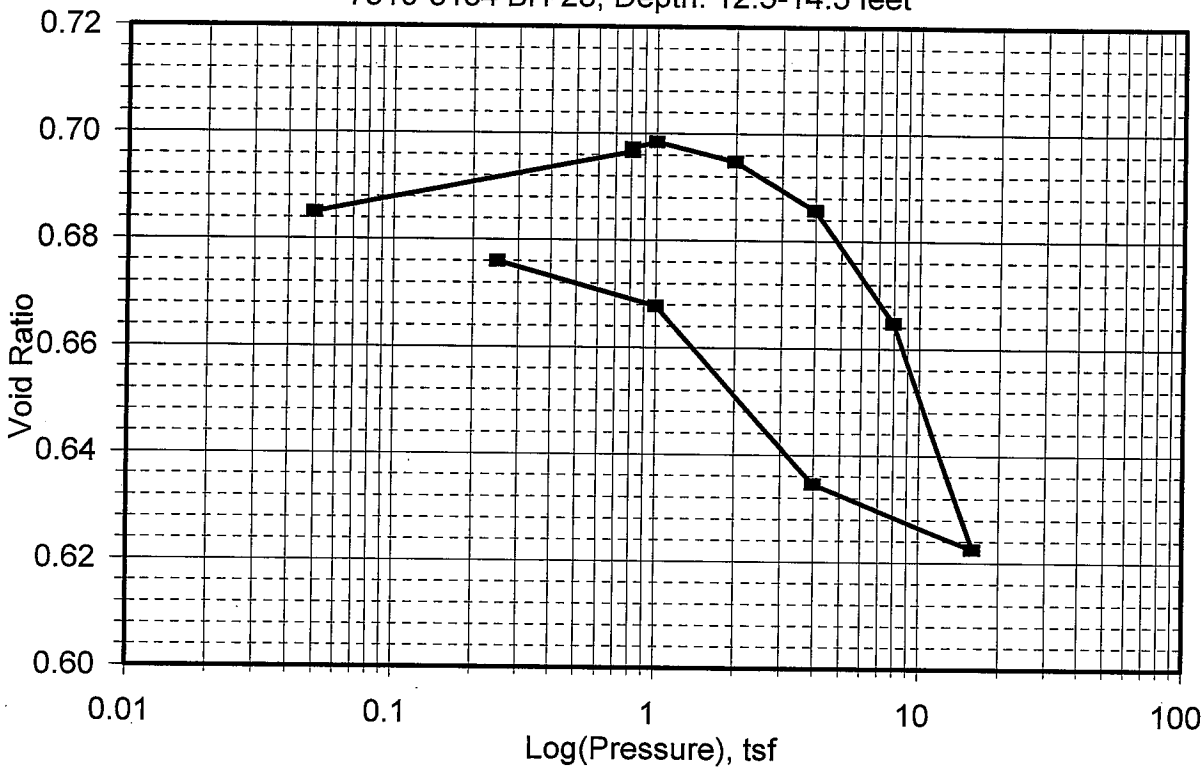
Consolidation Curve
Void Ratio versus Log (Pressure)
7310-3184 BH-17, Depth: 12.5-14.5 feet



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

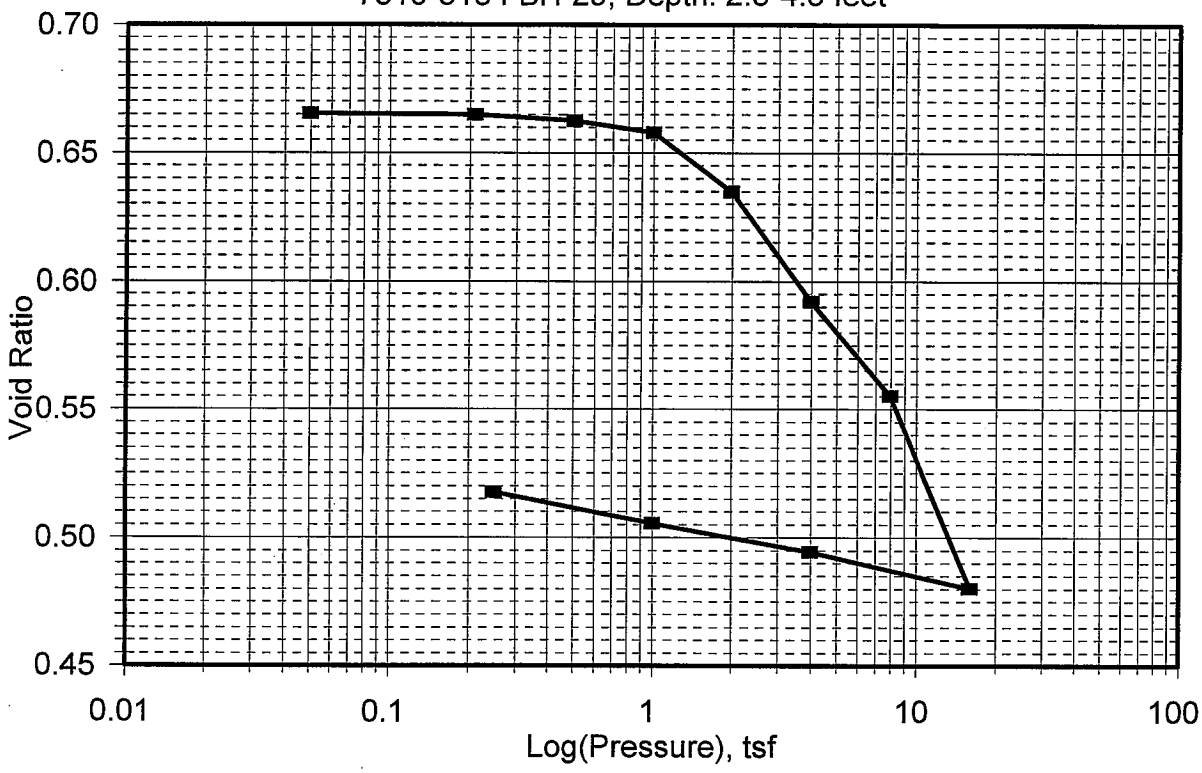
Consolidation Curve
Void Ratio versus Log (Pressure)
7310-3184 BH-23, Depth: 12.5-14.5 feet



STANDARD TESTING AND ENGINEERING COMPANY

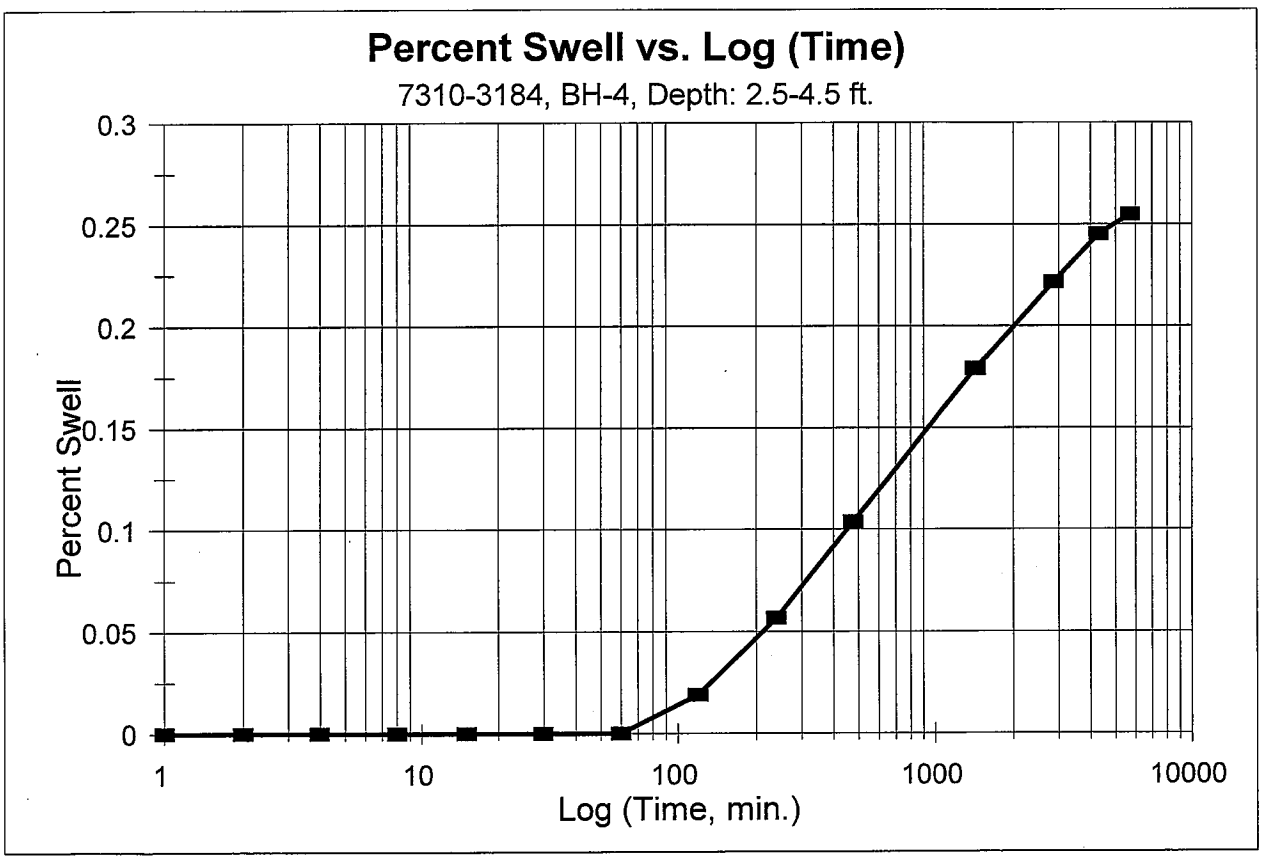
GEOTECHNICAL SERVICES

Consolidation Curve
Void Ratio versus Log (Pressure)
7310-3184 BH-29, Depth: 2.5-4.5 feet



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES



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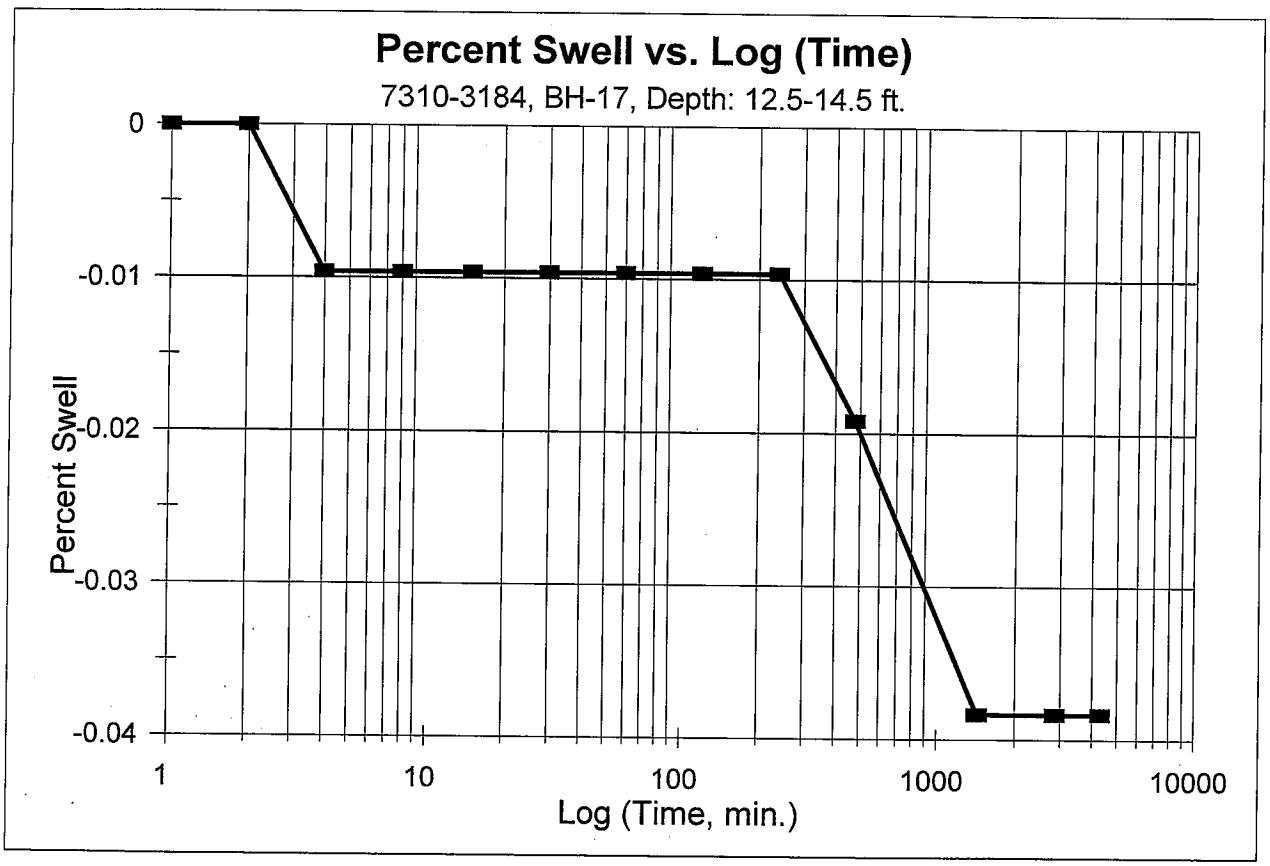
GEOTECHNICAL SERVICES



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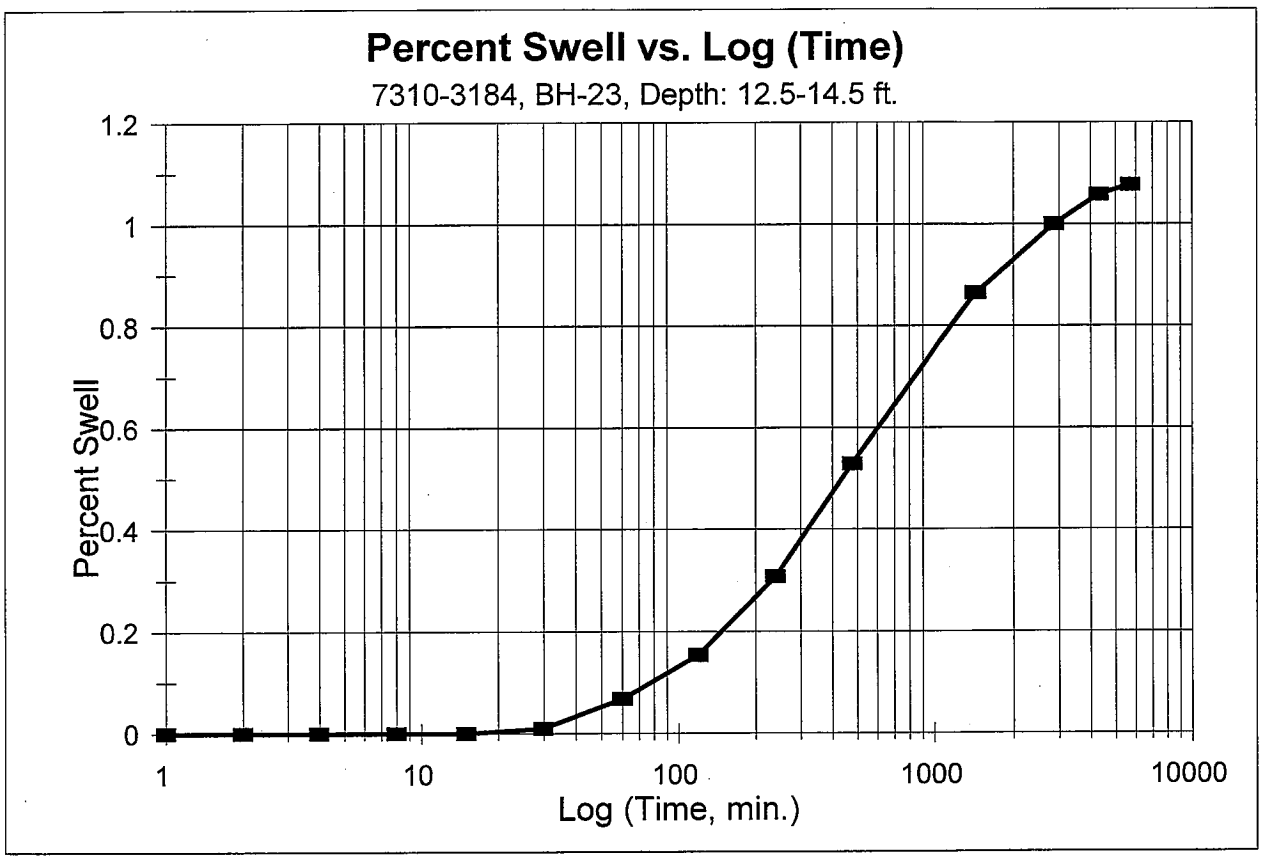
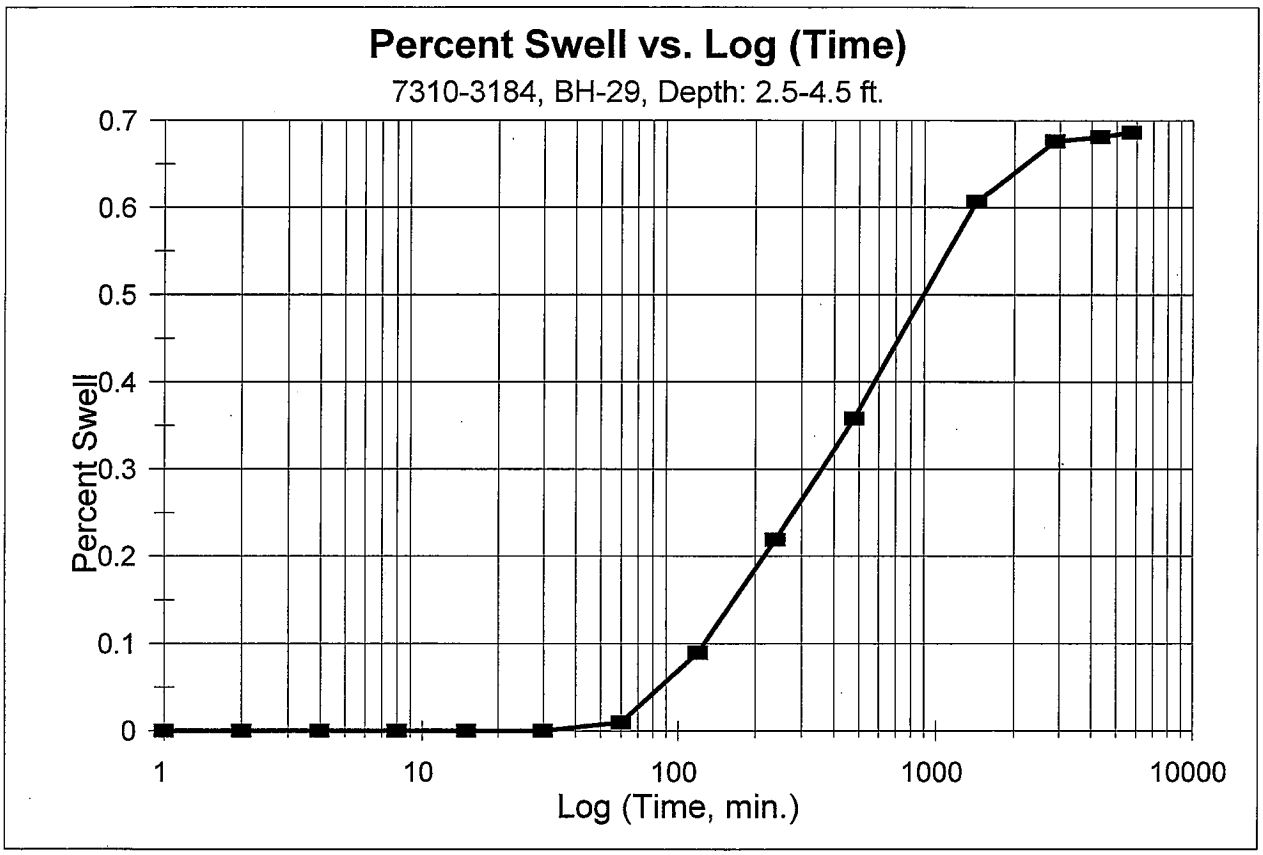
GEOTECHNICAL SERVICES



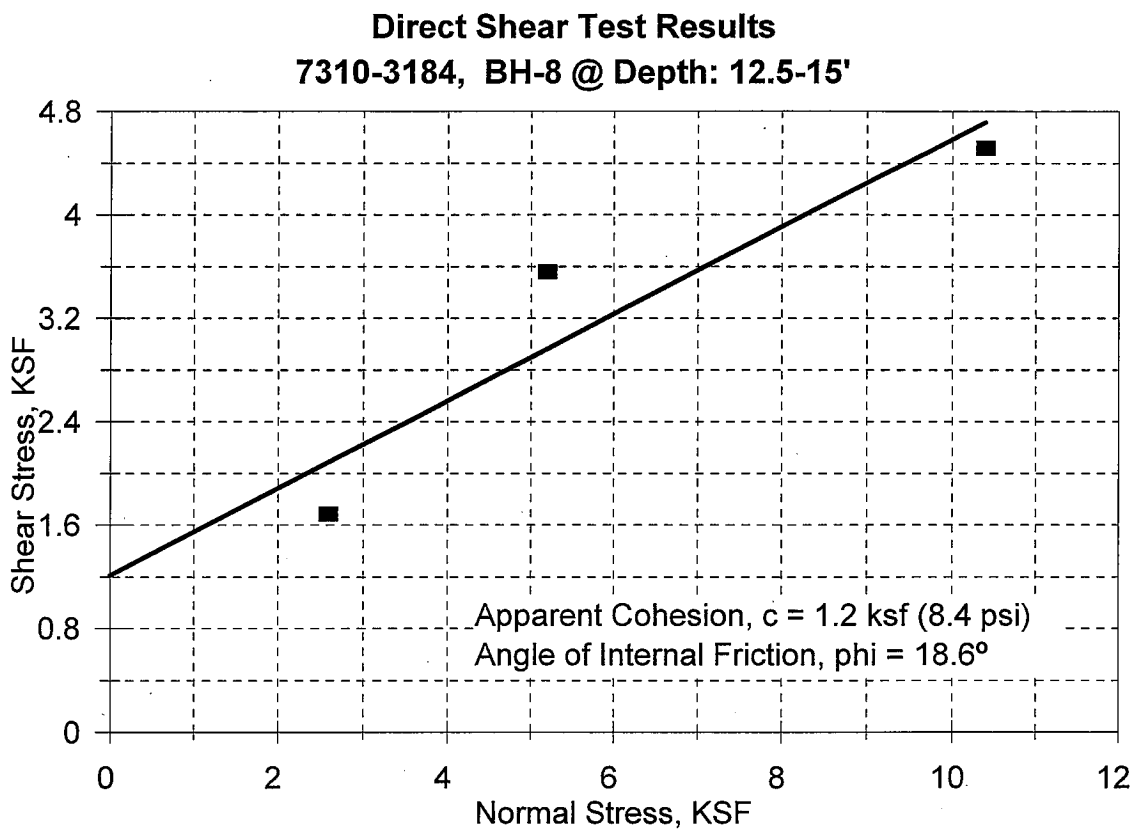
STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES



STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES



STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

CORPORATE OFFICE and CENTRAL LABORATORY
3400 N. Lincoln Blvd., Oklahoma City, OK 73105 (405) 528-0541
CA77 Exp. 06/30/07

Area Offices

5358 S. 125th E. Ave., Ste. B	Tulsa, OK 74146	(918) 459-2700
902 Trails West Loop	Enid, OK 73703	(580) 237-3130
202 SE "J" Ave.	Lawton, OK 73501	(580) 353-0872

File No.: 7310-3184
Report Date: 05/07/10
Project: Ft. Sill AIT Barracks
Location: Lawton, Oklahoma

Date Sampled: 03/24/10
Sampled By: Johnny Jarman

REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS

LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-8F (1) Depth (ft.): 12.5-15		
Shear Device	Humbolt HM-2500		
Specimen Description	Reddish Brown Clay w/ Seam of Sand		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	130.9		
Diameter, in	2.5		
Normal Stress, ksf	2.6		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.1	0.963	0.942
Water Content, %	25.1		36.4
Moist Unit Weight, pcf	115.3		146.8
Dry Unit Weight, pcf	92.2	105.3	107.6
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	1.69		
Lateral Displacement, %	5.20		
Change from Consolidated Height, %	-14.36		

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

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REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS

LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-8F (2) Depth (ft.): 12.5-15		
Shear Device	Humbolt HM-2500		
Specimen Description	Reddish Brown Clay w/ Seam of Sand		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	121.2		
Diameter, in	2.5		
Normal Stress, ksf	5.2		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.06	0.8932	0.875
Water Content, %	23.5		34.2
Moist Unit Weight, pcf	109.4		144.0
Dry Unit Weight, pcf	88.6	105.1	107.2
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	3.56		
Lateral Displacement, %	9.20		
Change from Consolidated Height, %	-17.43		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES

CORPORATE OFFICE and CENTRAL LABORATORY
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File No.: 7310-3184
Report Date: 05/07/10 — Date Sampled: 03/24/10
Project: Ft. Sill AIT Barracks — Sampled By: Johnny Jarman
Location: Lawton, Oklahoma

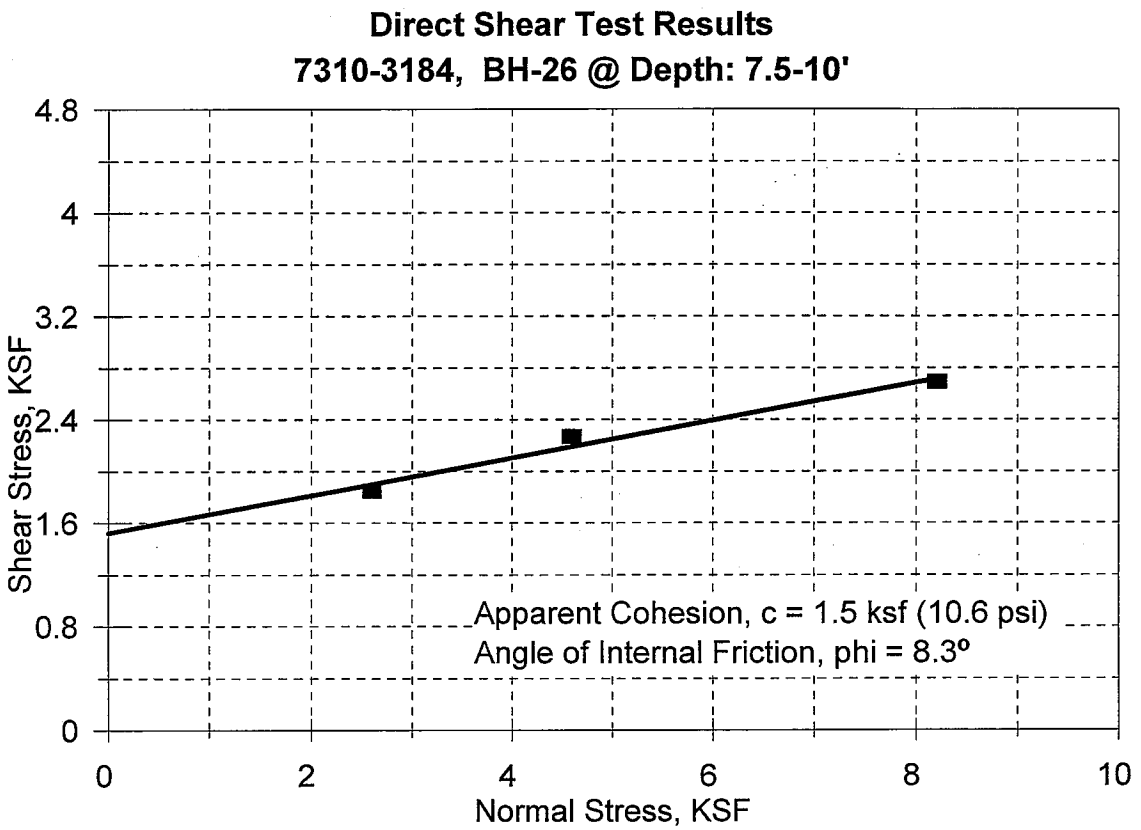
REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS
LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-8F (3) Depth (ft.): 12.5-15		
Shear Device	Humbolt HM-2500		
Specimen Description	Reddish Brown Clay w/ Seam of Sand		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	143.9		
Diameter, in	2.5		
Normal Stress, ksf	10.4		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.09	1.018	0.998
Water Content, %	23.4		28.6
Moist Unit Weight, pcf	126.2		143.6
Dry Unit Weight, pcf	102.2	109.5	111.6
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	4.52		
Lateral Displacement, %	6.80		
Change from Consolidated Height, %	-8.78		

STANDARD TESTING AND ENGINEERING COMPANY

GEOTECHNICAL SERVICES



STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

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File No.: 7310-3184
Report Date: 05/07/10
Project: Ft. Sill AIT Barracks
Location: Lawton, Oklahoma

Date Sampled: 03/18/10
Sampled By: Johnny Jarman

REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS

LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-26D (1) Depth (ft.): 7.5-10		
Shear Device	Humbolt HM-2500		
Specimen Description	Light Gray & Light Brown Clayey Sand w/ Gravel		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	133.8		
Diameter, in	2.5		
Normal Stress, ksf	2.6		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.001	0.9953	0.987
Water Content, %	23.8		32.9
Moist Unit Weight, pcf	128.1		139.6
Dry Unit Weight, pcf	103.5	104.1	105.0
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	1.85		
Lateral Displacement, %	3.60		
Change from Consolidated Height, %	-1.43		

STANDARD TESTING AND ENGINEERING COMPANY
GEOTECHNICAL SERVICES

CORPORATE OFFICE and CENTRAL LABORATORY
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File No.: 7310-3184
Report Date: 05/07/10
Project: Ft. Sill AIT Barracks
Location: Lawton, Oklahoma

Date Sampled: 03/18/10
Sampled By: Johnny Jarman

REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS

LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-26D (2) Depth (ft.): 7.5-10		
Shear Device	Humbolt HM-2500		
Specimen Description	Light Gray & Light Brown Clayey Sand w/ Gravel		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	130.1		
Diameter, in	2.5		
Normal Stress, ksf	4.6		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.03	1.00035	0.996
Water Content, %	22.3		36.1
Moist Unit Weight, pcf	119.6		137.7
Dry Unit Weight, pcf	97.8	100.7	101.1
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	2.27		
Lateral Displacement, %	3.20		
Change from Consolidated Height, %	-5.60		

STANDARD TESTING AND ENGINEERING COMPANY — GEOTECHNICAL SERVICES

CORPORATE OFFICE and CENTRAL LABORATORY
3400 N. Lincoln Blvd., Oklahoma City, OK 73105 (405) 528-0541
CA77 Exp. 06/30/07

Area Offices

5358 S. 125th E. Ave., Ste. B	Tulsa, OK 74146	(918) 459-2700
902 Trails West Loop	Enid, OK 73703	(580) 237-3130
202 SE "J" Ave.	Lawton, OK 73501	(580) 353-0872

File No.: 7310-3184
Report Date: 05/07/10
Project: Ft. Sill AIT Barracks
Location: Lawton, Oklahoma

Date Sampled: 03/18/10
Sampled By: Johnny Jarman

REPORT: DIRECT SHEAR TEST OF SOILS UNDER CONSOLIDATED-DRAINED CONDITIONS

LAB NO: 7310-3184
TEST METHOD: ASTM D3080

TEST RESULTS

Sample I.D.	BH-26D (3) Depth (ft.): 7.5-10		
Shear Device	Humbolt HM-2500		
Specimen Description	Light Gray & Light Brown Clayey Sand w/ Gravel		
Specimen Condition	Thin-Walled Tube Sample		
Dry Mass, g	123.8		
Diameter, in	2.5		
Normal Stress, ksf	8.2		
Rate of Deformation, in/min	0.0019		
	Initial	After Consolidation	After Shear
Height, in	1.01	0.93235	0.931
Water Content, %	26.3		39.4
Moist Unit Weight, pcf	119.9		143.6
Dry Unit Weight, pcf	94.9	102.8	103.0
Response at Maximum Nominal Shear Stress			
Nominal Shear Stress, ksf	2.69		
Lateral Displacement, %	2.20		
Change from Consolidated Height, %	-7.86		

Environmental Testing Inc. 488-2400
4619 N. Santa Fe, OKC, OK 73118 - (405) 488-2400 - (405) 488-2404 fax

Analytical Report

Report Date:	05/04/2010
Order #	2010040375
Project #	2310-3184

Laboratory Certificate # 7211

Client: **Mr. Jieliang Pan**
Standard Testing
3400 N. Lincoln
Oklahoma City, OK 73105

Project: **Ft. Sill Barracks**

Analytical Results

Client Sample ID: **Composite #1** ETI ID: **1**
Sample Collected : **04/22/2010 @ 16:05** Matrix: **Solids**

Parameter	Result	Units	Analyzed On	Analyst	Method
Redox	200	mV	04/29/2010 01:10:00 PM	LH	

Client Sample ID: **Composite #2** ETI ID: **2**
Sample Collected : **04/22/2010 @ 16:05** Matrix: **Solids**

Parameter	Result	Units	Analyzed On	Analyst	Method
Redox	251	mV	04/29/2010 01:10:00 PM	LH	

Samples not on ice. Samples received out of temperature requirement.

Respectfully Submitted:

Russell Britten
President

Unless ETI receives prior notification, all sample material not consumed in analysis will be retained for a period of 30 days before disposal.

Environmental Testing Inc. 488-2400
4619 N. Santa Fe, OKC, OK 73118 - (405) 488-2400 - (405) 488-2404 fax

Quality Control Report

Report Date: 05/04/2010
Order # 2010040375

Laboratory Certificate # 7211

Quality Control

Solids

Duplicate

Parameter	QC Value	Units	ETI ID
Redox	6.0	% dif.	1,2

LCS

Parameter	QC Value	Units	ETI ID
Redox	99	% rec.	1,2

E = Estimated Value (above linear range)
M = Out of Control Due to Matrix Effect
D = Surrogate or Matrix Spike Diluted Out
Q = Outside of QC Limits on Both Original and Rerun
C = Possible Laboratory Contamination
* = Out of Control

J = Estimated Value (below linear range)
*TA = Lab ID: 9412
*ER = Lab ID: 8727

Order #: 2010040375

Appendix B

List of Drawings

Not Used

Appendix C

Utility Connections

See Appendix J Drawings

APPENDIX D

RESULTS OF FIRE FLOW TESTS

(WILL BE PROVIDED BY AMENDMENT)

Appendix E

Environmental Information

IMWE-SIL-PWE 6 Feb 09

MEMORANDUM FOR DPW, ATTN: IMWE-SIL-PWM (F. LePine)

SUBJECT: Record of Environmental Consideration (REC) – PN58531, Advanced Individual Training (AIT) Barracks Complex Area Development Plan

1. Upon receipt of the documentation for the subject project, the Environmental Quality Division (EQD) Directorate of Public Works (DPW) initiated an environmental review. This review was based on the documentation provided (Enclosures 1 and 2) by the DPW Master Planning Division on 8 January 2009. If the scope, location or conditions of this project change an additional review will be required. EQD concurs with this construction project provided the following comments are complied with and resolved in their entirety. It is the project manager / addressee's responsibility to confirm and document compliance with all of EQD's comments.

a. All National Environmental Policy Act (NEPA) requirements have been evaluated. The portion of land west of Blair Street has been determined not to meet the threshold requiring a formal Environmental Assessment (EA) or Environmental Impact Statement (EIS) since this land previously housed temporary WWII buildings. In the eastern portion of this project, there is approximately 13 acres of land between the existing concrete hardstands and Fort Sill Boulevard that shows no signs of previous development (Enclosure 3). If the DPW Master Planning Division's Facilities or Real Property Offices cannot provide adequate documentation of previous construction, this portion of the project must be evaluated through an EA per 32 CFR 651.33 (b) "military construction that exceeds five contiguous acres". Questions shall be directed to John Bumgarner (EQD) at 580-442-3274.

b. This project will require cultural resources consultation with the Oklahoma State Historic Preservation Office, Oklahoma Archeological Survey, the Fort Sill affiliated Native American tribes and the public IAW Section 106 of the National Historic Preservation Act as implemented under 36 CFR 800. It is imperative that the project proponent adheres to the requirements of the aforementioned regulations.

1) To initiate consultation, the Areas of Potential Effect (APE) will need to be identified. The APE is in two forms, **Direct** (definitive location and extent of all ground disturbance required to complete construction) and **Indirect** (visual effects from historic districts or buildings eligible for the National Register of Historic Places). The information required from the proponent includes, but is not limited to, the building (dimensions and height), support buildings, parking areas, driveways, utilities (from the point of connection from existing utilities to the new facility), materials and equipment laydown areas, grading, landscaping, etc. Building elevations are also required. This information is initially provided to the SHPO for concurrence prior to coordinating with

the remaining consulting parties. This information should be provided to Kevin Christopher (EQD) at 580-442-4455.

2) Once the SHPO has concurred with the APEs, Fort Sill can then coordinate with the remaining consulting parties and public to 1) solicit their input, 2) resolve potential effects, and 3) provide them the final determination. For this to occur, EQD will need a total of 14 copies (11 on CD and 3 hard copies (with half sized drawings)) of the scope of work, site plans, specifications and design drawings. At a minimum, these materials should be at the 35% design level and be provided to Kevin Christopher.

3) Provided the SHPO approves, Fort Sill will pursue an expedited consultation process which will still take a minimum of 120 days. Be advised that if the project undergoes substantial changes from what is represented to the consulting parties, it could potentially extend the consultation period. Also, if any consulting parties have questions or issues, the consultation period is still subject to being extended and potentially result in a determination of potential effects requiring mitigation to the project plans.

4) Furthermore, be advised that the speed at which this office can initiate consultation is predicated upon its current workload at that time. Unless directed otherwise by the DPW chain of command, project consultation is initiated in the order by which the aforementioned information, in its entirety, is received from the project proponents.

c. All subsurface utility lines, new and old, should be located and marked. If Asbestos Containing Material (ACM) is present (subsurface underground piping, etc.) and requires removal, it should be performed by an individual or firm trained in asbestos abatement and licensed with the State of Oklahoma. Questions should be directed to Darek Quickle (EQD) at 580-442-5671.

d. All solid waste and construction debris shall be delivered to the Fort Sill Landfill. The contractor can use the Fort Sill Landfill at no cost, as long as, they participate in Fort Sill's Construction and Demolition waste management program, which includes creating a waste management plan and reporting waste reuse and recycle quantities each month (Enclosure 4). Questions or concerns shall be directed to Gary Jarnagin (EQD) at 580-442-1041.

e. Removing trees with nesting birds may violate the Migratory Bird Treaty Act. If trees are to be removed for construction it should not be done during nesting season which runs between March and August. Questions should be directed to Glen Wampler (EQD) 580-442-4324 / 4648.

IMWE-SIL-PWE
SUBJECT: Record of Environmental Consideration (REC) – PN58531, Advanced Individual Training (AIT) Barracks Complex Area Development Plan

f. This project covers more than one acre of land and will require a Stormwater Permit for construction. Some stormwater detention may also be necessary to mitigate increased runoff from the development. Question should be directed to Lee Silverstrim (EQD) 580-442-1144 / 3266.

g. In reference to the bullet "Unexploded Ordnance: Evaluation Underway" (Enclosure 2), MEC surveys have been previously conducted in this area, however no survey is currently taking place. Although there is always a potential of finding UXO / MEC within the cantonment area, the level of previous ground disturbance makes this project area low risk for the finding of UXO / MEC. Questions should be directed to Robert Rowden (EQD) 580-442-4651.

2. Other questions or concerns can be directed to the undersigned at 580-442-5445 or John Bumgarner at 580-442-3274.

John Bumgarner

for GLEN WHEAT
Chief, Environmental Quality Division
Directorate of Public Works

ENCLS
1. DPW Email – 8 Jan 2009
2. Project Location Map
3. Possible EA Location
4. Waste Management Plan

Sminkey, Sarah E CIV USA

From: Bumgarner, John E Mr CIV USA IMCOM
Sent: Thursday, January 08, 2009 2:51 PM
To: LePine, Francis P Mr CIV USA IMCOM
Cc: Sminkey, Sarah E CIV USA
Subject: FW: Site plans (UNCLASSIFIED)

Attachments: FIBs_AIT_Chapel_Fitness_8_Jan_09.pdf

FIBs_AIT_Chapel_F
itness_8_Jan_...

-----Original Message-----
From: LePine, Francis P Mr CIV USA IMCOM
Sent: Thursday, January 08, 2009 10:07 AM
To: Wheat, Glen CIV USA IMCOM; Bumgarner, John E Mr CIV USA IMCOM
Cc: Butler, Randall J CIV USA IMCOM; Banner, Jeffrey S CIV USA
Subject: Site plans (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

Glen, John,
I'm trying to get a package together for GC for his written approval for the four projects shown in the attachment. There's a team coming 26 Jan to do charrettes on these projects and they want approved site locations. You should be aware and have been invited to the charrettes.

We have RECs for two of the projects - Chapel and Physical Fitness facs - and that is indicated. You have not seen the AIT site before; we did a charrette for the Fires BDE project back in 05. Considering the environment we're in now it'll need a REC too.

Request that you fit RECs for the two projects into your queue. I do not expect you to try and get them done by the 26th.

Jeff,
This is info you can send out to the participants at the 26 Jan charrettes.

Frank LePine
C, Master Planning Div, DPW
580.442.3517

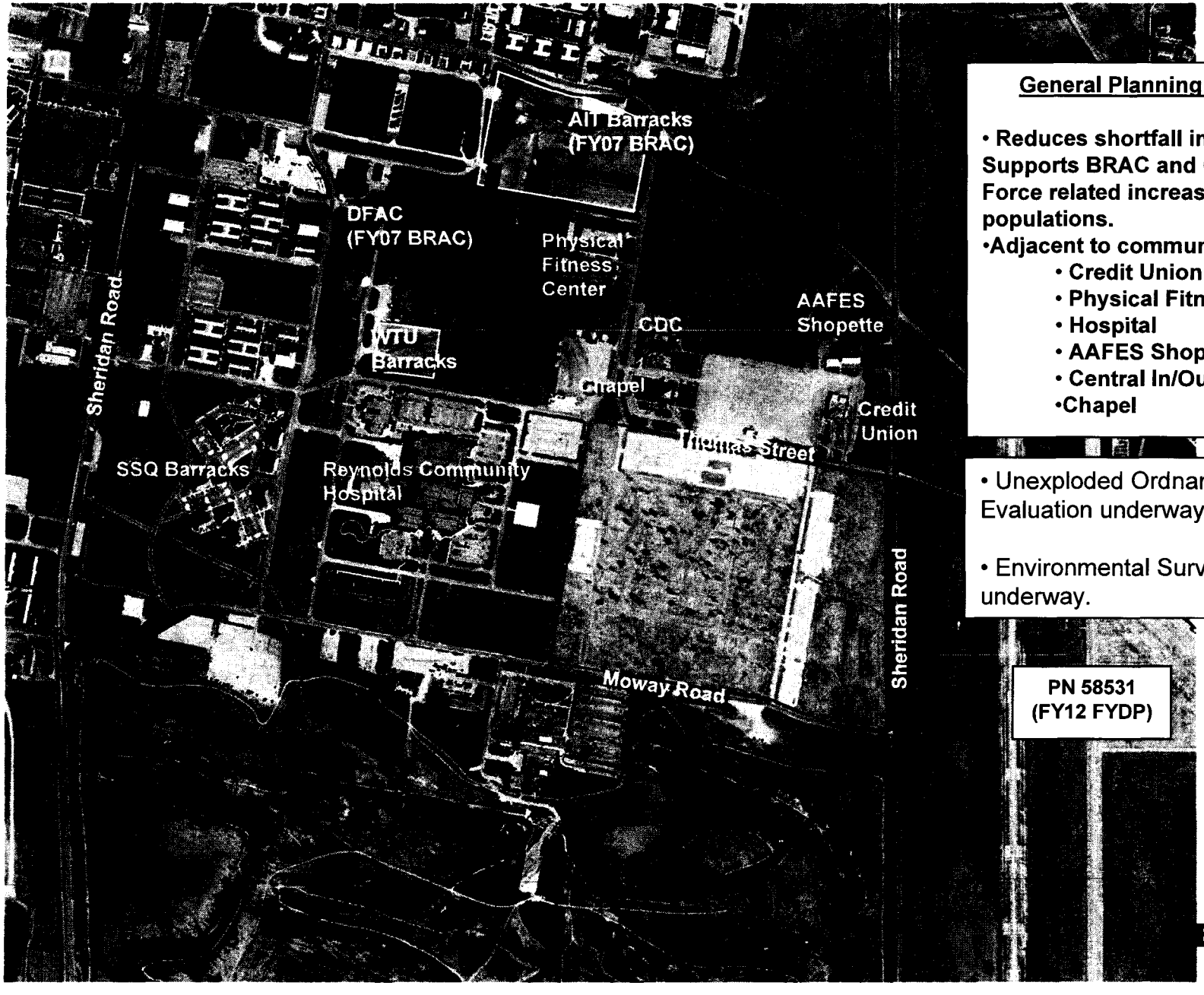
HOW ARE WE DOING?
Click on ICE to let us know.

frank.lepine@us.army.mil
frank.lepine@conus.army.mil

"i tried to kick a habit, but it was wearing shin guards"
Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED

Area Development Plan – PN58531 AIT Barracks Complex



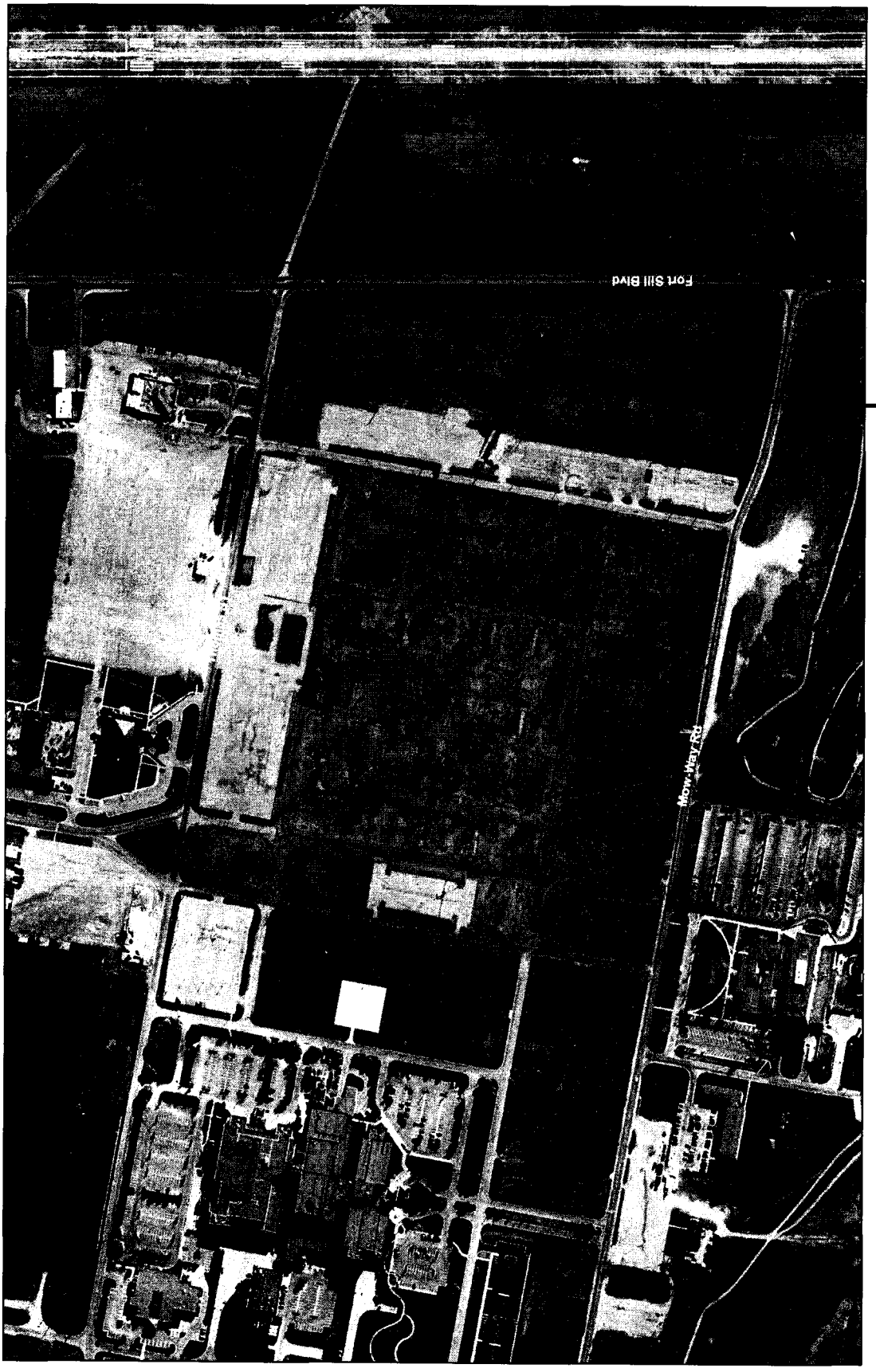
General Planning Information

- **Reduces shortfall in AIT Barracks. Supports BRAC and Grow the Force related increases in student populations.**
- **Adjacent to community facilities:**
  - **Credit Union**
  - **Physical Fitness Facility**
  - **Hospital**
  - **AAFES Shoppette**
  - **Central In/Out processing**
  - **Chapel**

- Unexploded Ordnance: Evaluation underway.
- Environmental Survey: Evaluation underway.

PN 58531
(FY12 FYDP)

ENCLS 2



ENCLS 3

Area of Potential Concern
That Would Require an EA

0 130 260 520 780 1,040
Feet

N

Waste Management Plan

The Contractor shall take a pro-active, responsible role in the management of construction and demolition waste and use all reasonable means to divert construction and demolition waste from landfills to facilitate their reuse or recycling. In the management of waste, consideration shall be given to the availability of viable markets, the condition of the material, the ability to provide the material in suitable condition and quantity, and time constraints. Revenues or other savings obtained for salvage, or recycling shall accrue to the Contractor. Firms and facilities used for recycling, reuse, and disposal shall be appropriately permitted for the intended use to the extent required by federal, state, and local regulations.

1.1 DISPOSAL

Except as otherwise specified in other sections of the specifications, disposal shall be in accordance with the following:

a. Reuse - First consideration shall be given to salvage for reuse. Sale or donation of waste suitable for reuse shall be considered. Salvaged materials, other than those specified in other sections to be salvaged and reinstalled, shall not be used in this project without the Contracting Officer approval. Items containing lead paint or asbestos shall not be reused or recycled.

b. Recycle - Waste materials not suitable for reuse, but having value as being recyclable, shall be made available for recycling whenever economically feasible.

c. Landfill - Materials with no practical use or economic benefit shall be disposed at the Fort Sill Municipal Landfill or the Fort Sill Construction and Demolition Landfill. Concrete or asphalt that is not recycled or reused can be accepted at the landfill only if it separated from other rubble. Metals are not accepted and must be recycled.

1.2 RECORDS

Records shall be maintained to document the quantity, in actual or estimated weights, of waste diverted through sale, reuse, or recycling. The records shall be delivered to Fort Sill Environmental Quality Division on a monthly basis, at or near the first week of the month.

1.3 DISPOSAL OF CHEMICAL WASTES

Chemical wastes shall be stored in appropriate and compatible containers, transported from the work area to Environmental Quality Division, Building 2592, for proper disposal.

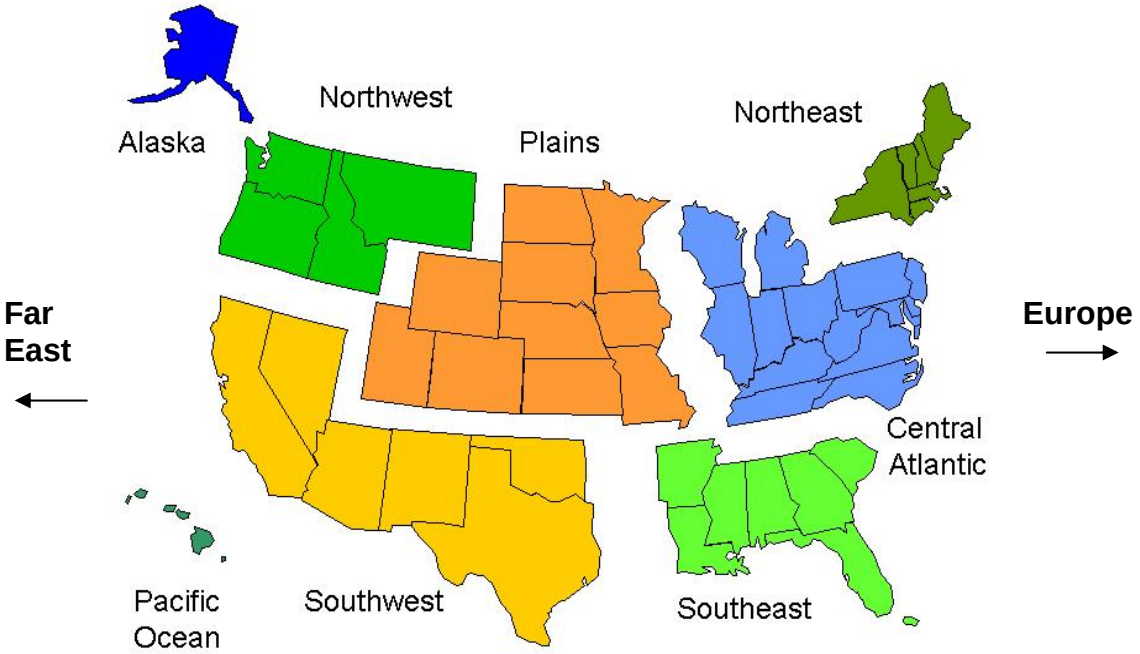
1.4 HANDLING OF SOLID WASTES

All handling and transportation shall be the responsibility of the contractor. Methods shall be protective of public safety, human health and the environment. The Contractor shall be in compliance with Federal, State, and local requirements for solid waste disposal.

Appendix F

Conceptual Aesthetic Considerations

Appendix L
EXTERIOR COLOR CHARTS



Southwest USA

L.1 Colors schemes and building materials are critical design elements in relating adjacent buildings and creating a compatible visual environment within an installation. This section identifies the Army standard palate of colors that will unify installations. A sufficient color palate range is provided to allow for variety. General direction on the use and application of materials and their colors follows --

- Avoid cluttered, cosmetic application of a number of different materials on a façade. Use materials consistently on all facades of a building.
- Select materials based upon their appropriateness to the building type, climatic conditions, and prevailing architectural design and landscape character of the installation.
- Utilize materials distinctive to an architectural character worthy of merit consistently throughout an installation.
- Relate buildings with compatible material and similar colors.
- Select colors for material from the Army color standard on the basis of the desired appearance, function, attractiveness of the building, and its compatibility with adjacent building colors.
- Limit exterior building colors to the Army established color palette. This provides each area a coordinated palette of similar colors that are subdued and harmonious. Avoid strong, loud colors.

EXTERIOR COLOR CHART *Southwest USA*

Building Design Element		Required Color Standard	Color Sample	Notes (Hyperlinked)
Walls	Base (primary) material	Tan Brick or native stone		
	Secondary material	Almond 5910W or Tan 23717		
		Mocha 20372		
Roof	Sloped areas	Metal Bronze or Terracotta		
		Clay Terracotta		
		Fiberglass Shingle Gray/White		
	"Flat" areas	White		
Fenestration	Doors	Wood: White 5770W		
		Steel: Dark Brown 5225N		
	Storm Doors	White		
	Door & Window Frames	Brown 20313		
	Storm window or sash	White		
	Window	White		
Trim Items	Fascia	White		
	Soffit	White		
	Gutters and D.S.	Brown 20313		
	Awnings and canopies	23717		
	Stair or balcony railings, balusters and related trim	Chocolate		
	Handrails	Brown 20313		

Building Design Element		Required Color Standard	Color Sample	Notes
Trim Items	Fire Escapes	Chocolate		
	Grilles and louvers	Brown 20313		
	Coping	Brown 20313		
	Roof ventilators	Blend to match roof		
Related Site Structures	Courtyard enclosure walls, retaining walls, fences, dumpster enclosures	Red Brick or Chocolate		
	Porch crawl space enclosure	White		

NOTES	
Note 1	***Installation: Enter notes where applicable***
Note 2	***Installation: Tab to expand note listings***
Note 3	Identify type, color and texture of local brick, stone, to include mortar color and joint style

Appendix G

GIS Data

Not Used

Appendix H

Exterior Signage

11.4 SIGNS

11.4.1 Signs are used to visually communicate information. They are highly visible features that should be attractive and compatible with their surroundings. Careful consideration must be given to what a sign says, how it is said, its visual appearance and organization, its location, structural support system, and relation to other signs within the installation. Standardized signage systems facilitate movement, provide a sense of orientation, and reinforce standards of excellence. Signage creates a unifying element throughout the installation that visually ties the installation themes together and builds a reference and continuity that translates into confidence and reassurance when traveling throughout the installation. The standards to apply for signage color,

type, and sizing is found in Technical Manual (TM) 5-807-10, *Signage*.

11.4.2 Sign System Characteristics. There are several basic design characteristics that, by serving to convey necessary information clearly and attractively, are an integral part of any successful signage system.

11.4.2.1 Simplicity. An effective strategy provides only needed information, avoids redundancy and eliminates over-signing with resultant clutter and visual confusion. Sign messages must be clear, simple, and easy for motorist to process quickly.

11.4.2.2 Continuity. It is essential that the system be applied uniformly and consistently throughout the entire installation. The importance of consistent implementation extends from the lager issues of sign type and size down to accurate color continuity and matching typestyles.

11.4.2.3 Visibility. Sign location is a very important ingredient within the system. Signs must be located at significant decision points and oriented to provide clear sight lines for the intended user. Close coordination of locations with respect to landscaping, utilities, adjacent signage, and various other street design elements is important to ensure long-term maximum visibility.

11.4.2.4 Legibility. Sign typestyle, line spacing, color, and size all combine to create the crucial design characteristics of legibility. This aspect of sign design should take into consideration users such as motorist, pedestrians or bicyclists, and the relative travel speed at which each type of user will be traveling when viewing the signs.

11.4.3 Vocabulary-Communications.

11.4.3.1 A common language has been created for establishing a signing system. The different components that create the sign package have been named and referred to within the total signing system.

11.4.3.2 The creation of a "signing language" helps generate a unified bond within sign types that make up a signing family.

- Reference

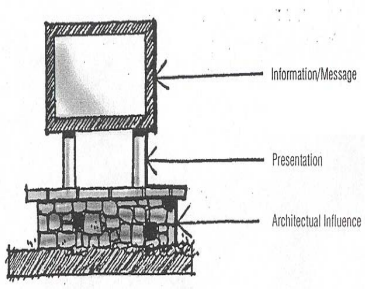


Fig. 11.18 - Signing Language Helps Establish A Signing System

- Information/Message
- Presentation
- Architectural Influence
- Graphic Architecture

11.4.4 Visual Hierarchy.

11.4.4.1 The entire signing system must communicate through a range of sign and typestyle sizes the relative importance of the individual activity that the sign identifies. The system should follow a logical progression from a point of origin to the desired destination.

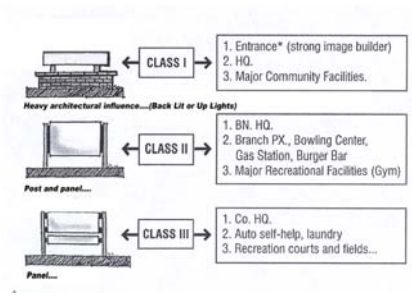


Fig. 11.19 - Signs Can Be Organized Into Classes Within The Visual Hierarchy

11.4.4.2 A stated ranking method supports the visual standard of hierarchy within the signing system. Signs can be organized within assigned classes with emphasis on the function and image of the installation.

11.4.4.3 Within each class, the level of architectural influence evokes the importance of the sign to the installation. This is also critical to the idea of progression. The importance of a sign must be presented in its size and level of detail.

11.4.4.4 As individuals move closer to their destination on the installation, the scale of the sign becomes progressively smaller and the level of the message more detailed.

11.4.5 Types of Signs.

11.4.5.1 Information / Identification Signs.

These are signs that identify entrances to the installation, areas within the installation, major tenants, buildings and organizational or functional components (Fig. 11.20). They identify a location, and greet the visitor to that location. They should be compatible in scale and character with the architecture and also blend with the natural surroundings (Fig. 11.20). These signs are designed to include the following:

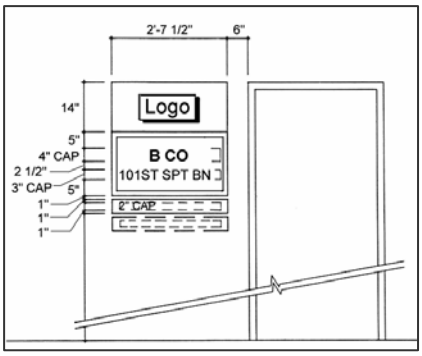


Fig. 11.20 – Building Mounted Information Sign

11.4.5.1.1 Typeface: Lettering is self-adhesive backing material.

- Building Title: Helvetica Medium, Upper and lower case
- Building Numbers: Helvetica regular
- Building Addresses: Helvetica Medium, Upper and lower case

Fig. 11.20 – Use of Street Addresses

11.4.5.1.2 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.1.3 Materials

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial
- Building numbers: Concealed mechanical fasteners at each corner of panel into building wall (Fig. 11.21).

11.4.5.1.4 Building Identification.

11.4.5.1.4.1 Street Addresses. The addressing procedures prescribed in DoD 4525.8-M, *DoD Official Mail Manual* are mandatory for use by all DoD components. DoD 4525.8-M, Chapter 3 prescribes the following:

- All DoD address shall be assigned so they are compatible with the United States Postal Services automated delivery point sequencing. (C3.3)

- The DoD installation is responsible for assigning city-style, street address on the installation. (C3.3.2.2)

- Street addresses shall be assigned and used even though a DoD activity may deliver the mail to the addressee. (C3.3.2.2.1)

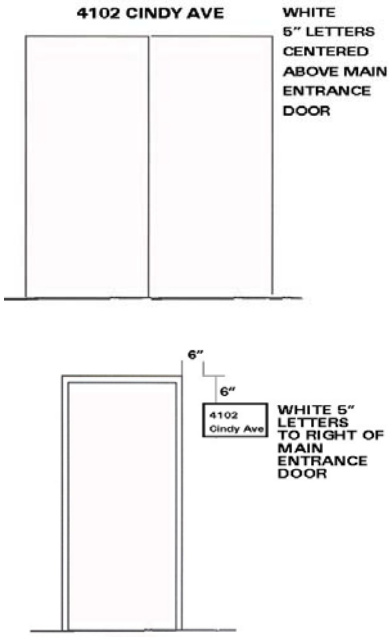


Fig. 11.21 - Street Address Location at Entrance Doors

- Only geographically locatable civilian-style street address (such as 4102 Cindy Avenue, Fig. 11.21) shall be used. (C3.3.2.2.4)

- Installations shall not use one street address for the entire installation and then use secondary unit designators such as "Building 123"to designate the delivery addresses on the installation. (C3.3.2.2.5)

- Addresses such as "Building 123 Roberts Street" are not a valid address format and shall not be used. (C3.3.2.2.6)

11.4.5.1.4.2 Address Placement.

- Place addresses by the front entrance of the building so they can be seen. (C3.3.2.3.1)

- Place both the street name and address number on the building if both the building number and street address are visible from the street.

- Building identification signs will use street addresses (Fig. 11.21).

- Buildings without identification signs shall have the address number and street name centered above the main entrance or located to the right side (Fig. 11.21).

11.4.5.1.4.2 Building Numbers. Where necessary building numbers will be located at a building corner, if visible from the main street and on building side facing parking lots. The size of the sign should be appropriate for the scale of the building and mounting height. See Technical Manual (TM) 5-807-10, *Signage*, para 3-5h, for various sign grid specifications.

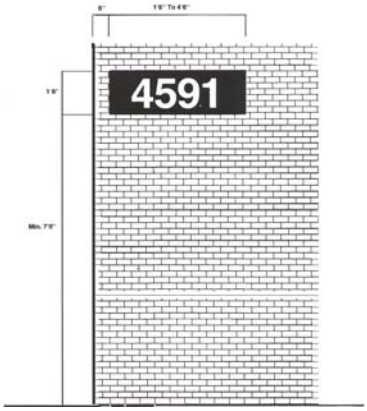


Fig. 11.22 - Dimensions for Building Number Corner Location, Where Necessary

11.4.5.1.5 Housing Areas.

11.4.5.1.5.1 The sign should be complimentary to the architectural setting of the housing area and approved by the installation Real Property Planning Board.

11.4.5.1.5.2 Housing numbers should be placed on the curb in front of the respective house and on the house where lighting will effectively light the numbering.

11.4.5.1.6 Installation Identification Signs.

11.4.5.1.6.1 Installation identification signs name the installation and display the official US Army plaque (Fig. 11.23). The designation "United States Army" must appear at the top of the sign in accordance with AR 420-70, para 2-7h. Every installation entrance shall have an installation identification sign displaying only the US Army plaque, with the words "United States Army, Fort (Name of Fort), and gate name as indicated in "Figure 11.23 - Installation Entrance Signs". The placement of Senior Mission Commander logo, unit crest, and other installation identification signs, monuments or displays shall be located inside the installation beyond the cleared area of the Access Control Point of entry. When used service- wide, these signs convey a uniform image of strength and stability to the public. Emblems, branch colors, unit mottos, names and titles of individuals are not to be displayed.

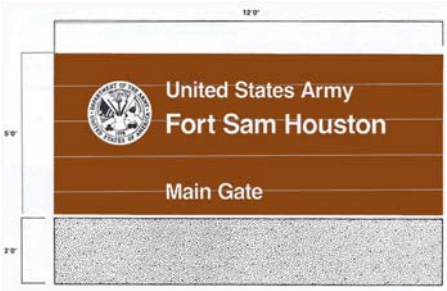


Fig. 11.23 - Installation Entrance Signs

11.4.5.1.6.2 Installation identification signs consist of three types:

- Sign type A1, main entrance sign, identifies the principal visitor entrance.
- Sign type A2, secondary entrance sign, identifies entry points with relatively high volumes of visitor traffic.
- Sign type A3, limited access entry gate signs, identifies entry points with limited public access.

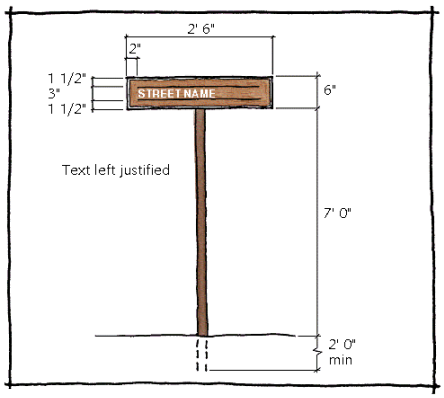


Fig. 11.24 - Typical Street Signs

11.4.5.1.6.3 See Technical Manual (TM) 5-807-10, *Signage*, paragraph 3-3, for sign specifications and paragraph 3-11 for sign placement guidelines.

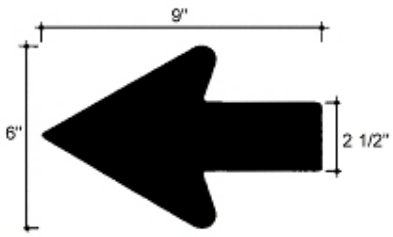


Fig. 11.25 - Typical Arrow For Use On All Destination Signs

11.4.5.1.6 Street Signs.

Street name identification signs should be designed with the same lettering, color and materials as other information signs.

11.4.5.1.7 Wheeled Electrical Signs.

Wheeled electrical signs will have an attractive presentation. Temporary landscape elements should be used whenever possible. The siting of this type of sign will be approved by

the RPPB. No sign of this type will be left in place for longer than six (6) months. After which time, the sign will be removed or turned into a permanent sign.

11.4.5.2 Directional Signs.

These signs guide the motorist or pedestrian in, around, and out of the installation (Fig. 11.26). The legibility and placement of these signs, as well as the ordering of information, is critical to their effectiveness. These signs should be placed in central locations and at major decision points along circulation routes (Fig. 11.26). These signs are designed to include the following:

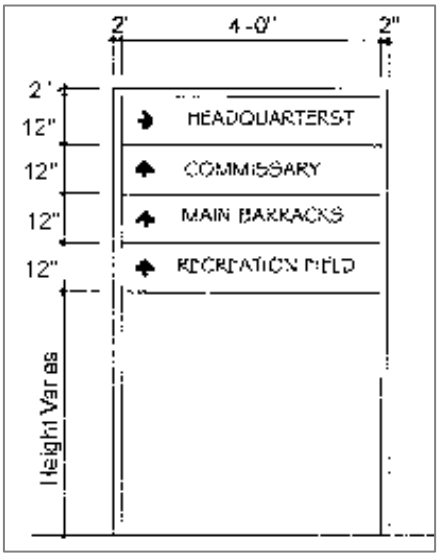


Fig. 11.26 – Direction Sign

11.4.5.2.1 Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.2.2 Arrow:

- Place at end indicating direction.
- Stoke width: Helvetica Medium cap

11.4.5.2.3 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.2.4 Materials

- Panel: Double-face 1/8” thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.3 Regulatory Signs.

These signs provide the rules for travel and parking on the installation. They include speed signs, turning and lane use signs, warning signs, parking control signs, etc. (Fig. 11.27). Related to these signs are pavement markings and traffic signals. These signs are designed to include the following:

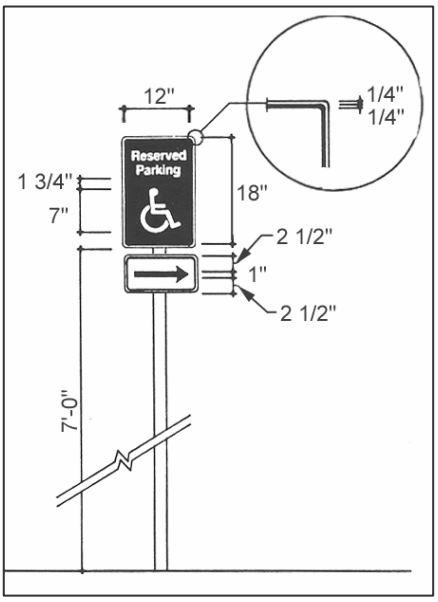


Fig. 11.27 – Regulatory Sign

11.4.5.3.1 Typeface: Lettering is self-adhesive backing material.

- Helvetica Medium upper and lower case

11.4.5.3.2 Color:

- Panel: Dark Brown
- Lettering: White
- Post: Dark Brown
- Exposed panel backs and edges: Dark Brown
- All paint semi gloss

11.4.5.3.3 Materials

- Panel: Double-face 1/8" thick aluminum
- Post: Steel Pipe
- Foundation: Concrete pier or direct burial

11.4.5.3.4 Traffic Control Signs.

11.4.5.3.4.1 CONUS Installations. National highway standards will be used for signs to regulate vehicular traffic on CONUS installation (AR 420-72, *Transportation Infrastructure And Dams*, Para 2-15f). These standards are described in the Manual of Uniform Traffic Control Devices (MUTCD). Also see MTMC Pamphlet 55-14, *Traffic Engineering for Better Signs and Markings*. This pamphlet clarifies existing standards and provides definite guidelines for installation officials to conform to the MUTCD. These standards shall be used installation wide to include installation Access Control Points.

11.4.5.2.4.2 OCONUS Installations. OCONUS installation streets and roads are to be considered extensions of the road system of the host nation and shall use traffic control device standards and criteria of the host nation (AR 420-72, *Transportation Infrastructure and Dams*, Para 2-15e).

11.4.5.3.5 Prohibitory (Warning) Signs. This category of signage is intended to maintain security and safety on the installation perimeter and at other specific secure areas. These signs notify visitors of restrictions, as well as other security procedures. The guidelines for design, fabrication, and placement of warning signs are found in Technical Manual (TM) 5-807-10, *Signage*, para 3-9.

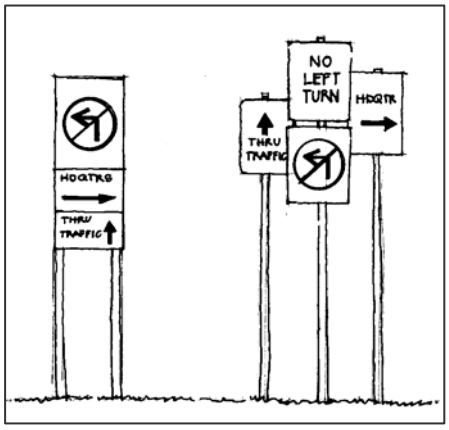


Fig. 11.28 – Sign should be Simple, Legible and Combined

11.4.6 Electronic Exterior Signs

All exterior flashing signs, traveling lights, or signs animated by lights of changing degrees of intensity or color are prohibited.

11.4.7 Sign Placement

Placement of signs differs according to the type of sign and the specific site constraints. The following guidelines apply to placement of the majority of signs.

- Do not place more than one sign at any location. Traffic rules are the exception to this rule (Fig. 11.28).
- Place signs in areas free of visual clutter and landscape materials.
- Place signs in locations that allow enough time for the user to read and react to the message.
- Signs should not be placed to block sight lines at intersections.
- Place signs approximately 1.2 meters (4 feet) above ground level to be within 10 degrees the driver's line of vision (Fig 11.29). Provide proper placement to avoid a hazard to children.

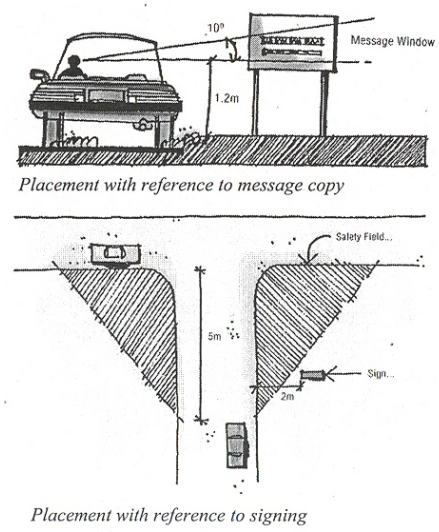


Fig. 11.29 - Placement Is Critical To Ensure Easy Readability

11.4.8 Sign System Typography.

11.4.8.1 Military Emblems. The Army has a rich tradition of military heraldry. Military emblems are an important part of the soldiers' identity and the emblems have been carefully crafted over the years to express unit pride and unique history and function of the unit. The care and use of organizational emblems in a signage system can add visual interest as well as build pride and a sense of history. However, the overuse of miscellaneous emblems can lead to clutter and a dilution of their importance. Colors for military emblems must be in accordance with the Institute of Heraldry.

11.4.8.2 Department of the Army Plaque. The plaque should be displayed on installation identification signage to emphasize the heritage and professionalism of the United States Army. The design of the plaque must be in accordance with Army Regulation (AR) 840-1, Department of

the Army Seal, and Department of the Army Emblem and Branch of Service Plaques, and must be reproduced in full color.

11.4.8.3 Insignias. The use of branch insignia, shoulder sleeve insignia, coat of arms and/or distinctive insignia on headquarters signs is permitted. All military emblems must appear in full color. Motivational symbols or motifs will not be used.

11.4.9 Reduce Visual Clutter.

11.4.9.1 Over-signing detracts form a uniform sign system and if left uncontrolled will eventually destroy the integrity of the system.

11.4.9.2 Clutter creates confusion and ineffectiveness. Often motorist and pedestrians are confused by the bombardment of messages that have no relationship to each other, or the communication is on such a minimal level that the sign serves no purpose.

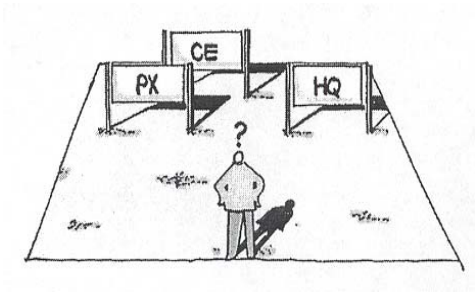


Fig. 11.30 - Visual Clutter Causes Confusion

11.4.10 Location Maps.

11.4.10.1 The location map is an integral element of an installation entrance. The location map display provides information and sense of place to the viewer. The design and construction should be of compatible architectural materials found throughout the installation.

11.4.10.2 The location map should contain the following characteristics within the design.

- Plexiglas covered map for protection
- Architectural compatible materials used for the base
- Paved walk-up area
- Litter receptacle
- Provide parking adjacent
- Provide current takeaway maps

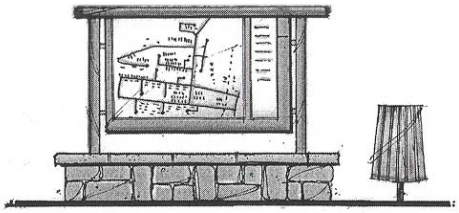


Fig. 11.31 - Location Maps Provide a Sense of Place

Appendix I

Acceptable Plant List

Section 10

LANDSCAPE DESIGN STANDARDS

10.1 INTRODUCTION

10.1.1 The Landscape Design Standards includes the selection, placement and maintenance of plant material on the installation. Landscape plantings provide a simple and cost effective enhancement to the general appearance of the installation.

10.1.3 The visual image conveyed by a military installation is defined not just by architectural character and site organization, but also by an attractive, organized landscape design. The presence of plant material on the installation greatly enhances the visual character and environmental quality of the installation.

10.1.2 Plantings add an element of human scale to open spaces and can be used functionally to screen undesirable views, buffer winds, reinforce the hierarchy of the circulation system or provide a visual transition between dissimilar land uses.

10.2 LANDSCAPE OBJECTIVES

10.2.1 The overall objective of the use of plant material within the installation is to improve the physical and psychological well being of the people who live and work on the installation. This is achieved through the following objectives:

10.2.1.1 Preserve and enhance urban trees, forest lands, and detailed planting features such as shrubs and groundcovers.

10.2.1.2 Improve the overall visual quality of the installation through the use of native plant material to (Fig. 10.1):

10.2.1.2.1 Blend to built environment with the natural environment.

10.2.1.2.2 Provide scale and comfort to pedestrian environments (Fig. 10.2).

10.2.1.2.3 Reinforce the hierarchy of the circulation system.

10.2.1.2.4 Screen unsightly views or elements.

10.2.1.2.5 Buffer incompatible land uses.

10.2.1.2.6 Minimize maintenance through the use of native plant materials that require less maintenance to survive.

10.2.1.2.7 Enhance Antiterrorism capabilities.

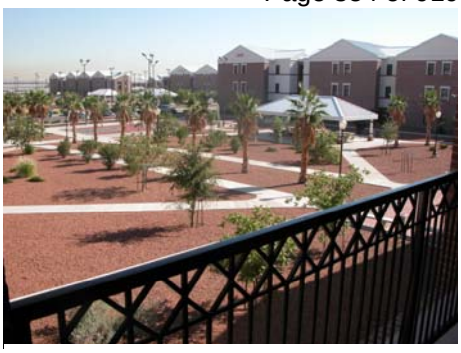


Fig. 10.1 - Use native Plants to Improve Visual Quality

Fig. 10.2 - Provide Comfort to Pedestrian Environment

Fig. 10.3 - Landscaping Reinforces Circulation Hierarchy

10.3 PRINCIPLES OF LANDSCAPE DEVELOPMENT

10.3.1 Landscape design is based on the following principles (Fig. 10.4).

10.3.1.1 Unity. The selection and placement of plant material can be used to blend, screen, and soften incompatible architectural or other unattractive visual impacts. Plant material as a unifying element can be placed in front of a building or view to frame and enhance the visual impact.

10.3.1.2 Balance. Plant material can be selected and placed to provide visual equilibrium or balance through the use of either a symmetrical or asymmetrical planting scheme. Symmetrical plantings are generally more formal while asymmetrical plantings are informal.

10.3.1.3 Contrast. Plant material can be selected and placed to provide differences in size and shape that add interest to the environment. Plants can be located to provide a backdrop for other plants such as a hedge behind a bed of annuals or perennials.

10.3.1.4 Rhythm. Repetition of a single plant or a mass of plants provides visual interest and formality to the landscape. Rhythm produces emphasis and unity and is especially effective in articulating main circulation routes.

10.3.1.5 Color and Texture. Plants can be selected and placed to provide visual interest according to their color and texture. Colors are classified as either warm (red, orange, yellow) or cool (violet, blue, green). Texture is classified as either coarse of fine.

10.3.1.6 Simplicity. Landscape plans should be broad and simple in form to limit excessive maintenance. Plant material should grouped in beds with simple edges that are easy to mow. Small turf areas should be avoided because of the difficulty of mowing. The use of annuals should be minimal because of the high maintenance involved.

10.3.1.7 Ultimate Effect. The landscape plan should be prepared with consideration for the mature size of all plants. The spacing of all material should utilize nursery industrial standards for mature material to account for spread as well as height. The ultimate height of the material should also be considered in relation to windows and other visual concerns.

10.3.1.8 Spatial Articulation. Plants can be selected and placed to create enclosed spaces or to separate spaces from one another. They can also be used to direct people by visually defining and reinforcing patterns of movement. The degree of enclosure, separation, or movement is dependent upon the density, form, and type of plants used.

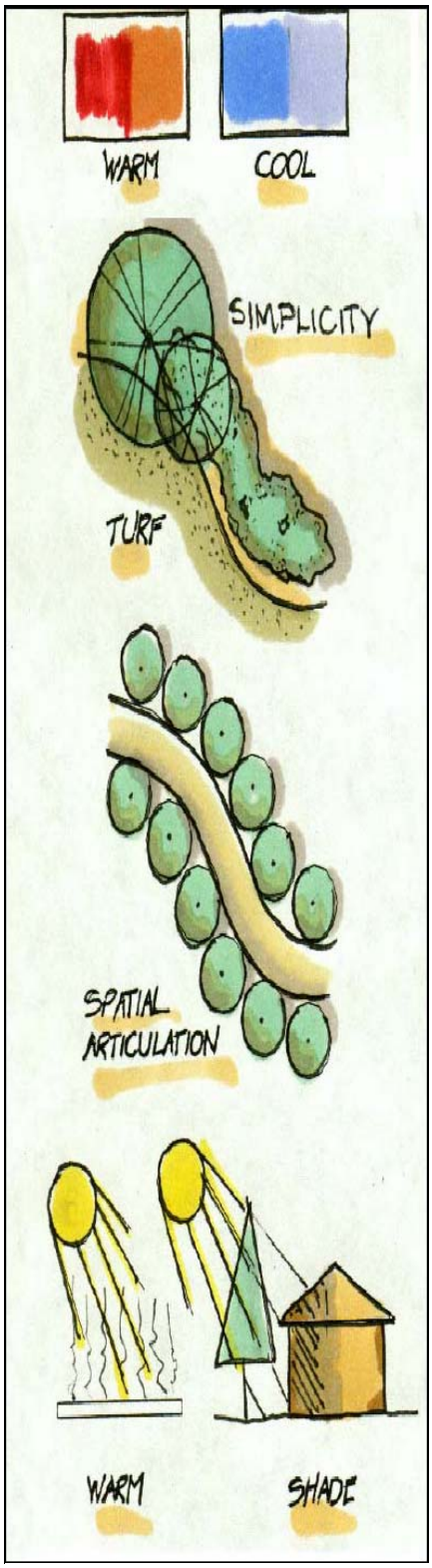


Fig. 10.4 - Principles of Design Illustrated

10.4 Sustainable landscape development

10.4.1 The use of plant material on the installation promotes the sustainability of the development. Trees, shrubs, groundcover, and vines provide aesthetic appeal as well as preservation of fauna and flora, energy conservation, climate modification, erosion control, air purification, and noise abatement (10.5).

10.5 LANDSCAPE DESIGN GUIDELINES

10.5.1 Proposed plantings must be reviewed to ensure that site conditions (soil, topography, adjacent uses, and architecture) and climatic criteria (sun, shade, and moisture requirements) are considered in the desired plant design and selection (i.e., form, texture, color, size). The uses and users of the site must also be considered. Landscape planting plans should be approved by qualified personnel to provide quality assurance and promote design consistency within each visual zone.

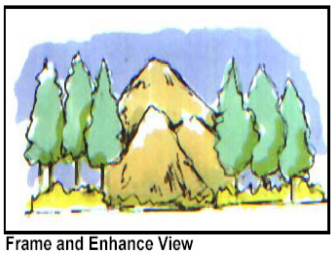
10.5.2 The following paragraphs present landscaping guidelines for the various locations of plant material use.

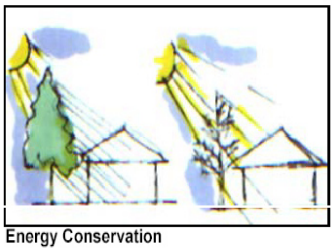
10.5.2.1 **Foundation Planting**. Foundation planting provides a green background for additional plantings, adds scale and character to the building, helps to integrate the building with its surroundings, screens HVAC and other utilities and helps create a sense of arrival (Fig.10.6). When developing foundation planting plans consideration should be given Antiterrorism measures (See paragraph 10.11).

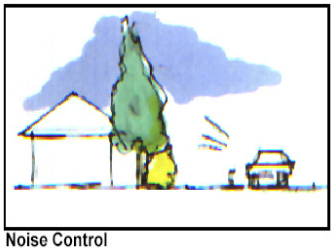
10.5.2.1.1 Focal and seasonal plantings should be located at building entries for pedestrian interest.

10.5.2.1.2 Use the architecture of the building to evaluate the planting design and selection of plants.

10.5.2.1.3 Plant materials should not block windows and views from interior spaces.


Frame and Enhance View


Energy Conservation


Noise Control

Wind Protection

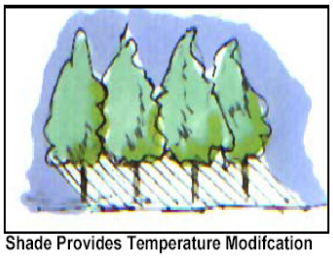

Shade Provides Temperature Modifcation

Fig. 10.5 Plant Material Promotes Sustainability

10.5.2.1.4 Trees shall be setback from the building walls to provide space for mature growth and to prevent root systems from damaging the foundation.

10.5.2.1.5 A symmetrical foundation planting design should be used for a symmetrical building.

10.5.2.1.6 Due to the possibility of insect problems (bee stings, etc.) do not plant flowering plants near entrances.

Fig. 10.6 - Foundation Plantings Help Screen Utilities

10.5.2.2 **Screening.**

10.5.2.2.1 Windscreens. Use a combination of evergreen and deciduous trees to provide windbreak protection from prevailing winds. Windbreak plantings should be irregular in form, rather than straight and evenly spaced, in order to provide more effective wind control and to visually blend with the natural character of the installation.

10.5.2.2.2 Screening of Dumpsters. Landscape planting should be used to supplement wood fence and masonry wall dumpster enclosures (Fig. 10.7).

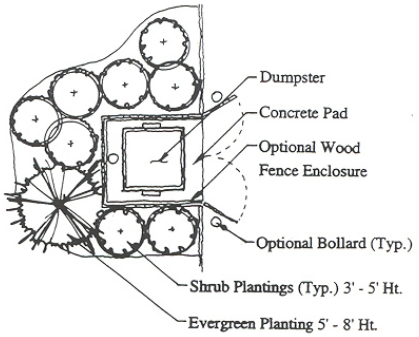


Fig. 10.7 - Screen Dumpsters

10.5.2.3 **Buffer Planting**. Use a mixture of evergreen and deciduous trees and shrubs to visually separate land uses and to help separate visual zones.

10.5.2.4 **Open Space Planting.** Enhance open space areas with planting. Use a mix of evergreen, deciduous, and flowering trees. Plant the same kind of trees in massive groupings to impact the vast open areas (Fig. 10.8).

10.5.2.5 **Street Trees**. Street tree plantings should be used to reinforce vehicular hierarchy, orient and direct traffic, upgrade views and to visually de-emphasize on-street parking (Fig. 10.9). Also, in the design of a street tree planting, separate plant species may be used to identify distinctive details or areas of the installation, for example, a particular land use relationship, historical district, community area or other similar entity.

10.5.2.5.1 Use formal street trees in single rows to visually reinforce primary and secondary roads. Use regularly

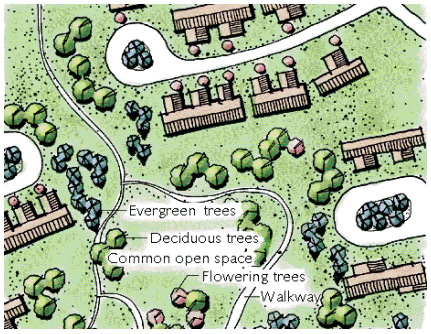


Fig. 10.8 - Enhance Open Spaces with Plantings

spaced and uniformly shaped deciduous trees to provide a regimented appearance.

10.5.2.5.2 Use informal groupings of street trees along tertiary routes. Utilize medium size deciduous trees to screen on-street parking along roadways. Set trees 1 to 2 meters (3 to 6 feet) from the back of curbs (Fig. 10.10). Spacing should be uniform, except where curb cuts interrupt regular spacing.

10.5.2.5.3 As a general rule, street trees should be deciduous species, resistant to salt and root pressure, and should have a 10' to 12' high clearance between the street pavement and branch height to allow adequate clearance for pedestrian and vehicle traffic to pass unimpeded by lower branches.

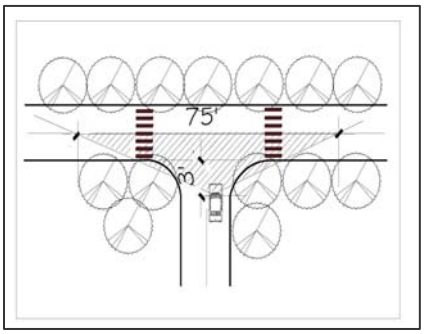


Fig. 10.9 – Use Street Trees to Visually Reinforce Roadway Hierarchy

10.5.2.5.4 The street tree layout should be coordinated with the layout of proposed street lighting.

10.5.2.5.5 Appropriate plant heights should be used within sight triangles to ensure safe views from intersections.

10.5.2.5.6 Weeping trees should not be used in locations where them may hang over the roadway or block views.

10.5.2.6 **Parking Lot Planting**. Parking lots are often the least attractive elements on a military installation. The use of landscape plant material and earth berms can greatly improve the appearance of these areas as well as help define circulation and reduce heat gain during summer months (Fig. 10.10).

10.5.2.6.1 Use shade tree plantings at parking lots to reduce glare and moderate ambient air temperatures on the lot. Optimum spacing of parking lot shade trees is 10 to 12 meters (35 to 40 feet) on center.

10.5.2.6.2 Choose trees and shrubs that require minimum maintenance and will not litter the parking area with leaves, fruit, or nuts.

10.5.2.6.3 Consider sight distances near entrances and exits when selecting and placing plant material.

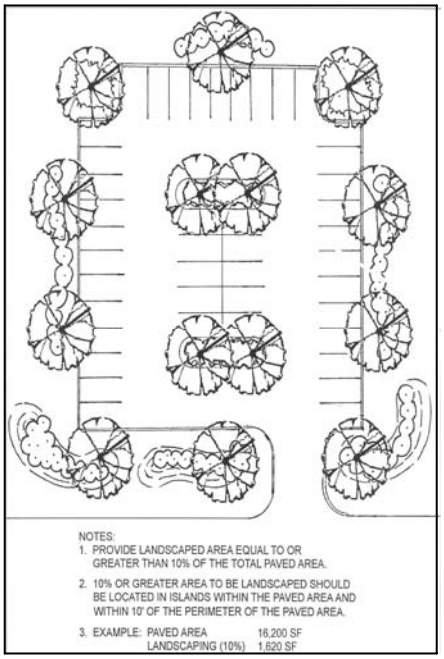


Fig. 10.10 - Provide Parking Lot Planting to Reduce Heat Gain

10.5.2.6.4 Select trees, shrubs, and ground covers that can withstand harsher conditions, such as sun, glare, heat, and reduced water supply.

10.5.5.6.5 Use a mix of evergreen and deciduous plant material to screen parking areas from adjacent uses.

10.5.2.7 **Environmental Control Planting**. When properly placed, plants can provide environmental benefits, as well as address visual concerns.

10.5.2.7.1 Use deciduous trees and shrubs at courtyards, buildings and along streets to provide shade, moderate temperatures and reduce glare during the summer months while allowing solar exposure in the winter.

10.5.2.7.2 Locate deciduous plantings on the southeast and southwest corner of buildings or courtyards to mitigate solar radiation and glare due to heat build-up and lower sun angles in the mid-morning and late afternoon hours.

10.5.2.7.3 Use mixed massings of deciduous shrubs and evergreen trees and shrubs to provide sound control along primary and secondary roads.

10.5.2.8 **Image Planting**. The image of the installation is formed by the visual impressions that exist within the installation. The primary locations of highly visible images are the main gate, along primary circulation systems, and at areas of high concentrations of people. Features such as signs, statues, static displays, and other primary visual images can be improved by the use of trees, shrubs, and ground cover.

10.5.2.9 **Entrances to the Installation**. The entrances and streetscapes into the installation are areas to place landscaping that will develop a strong visual image and provide visual interest during all four seasons. The entrance to the installation creates the first visual impression for the visitor (Fig. 10.11).

10.5.2.9.1 The landscape materials and planting areas should be proportional in scale to the hierarchy of the street on which they are located.

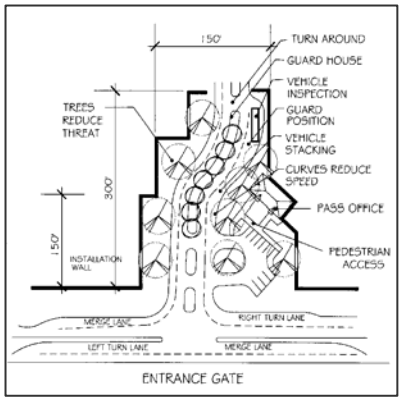


Fig. 10.11 - Landscaping at Entrance Gates will Meet AT/FP Requirements

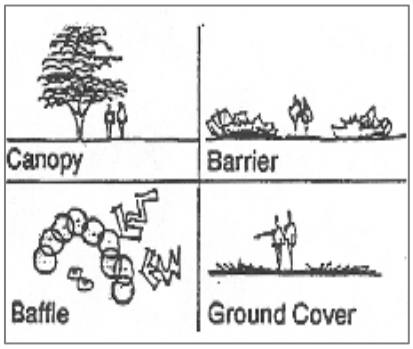


Fig. 10.12 Basic Design Categories

10.5.2.9.2 Landscaping must be integrated with the Force Protection requirements of Section 12. Low shrubs, groundcover, annual/perennial plants and canopy trees provide seasonal interest as well as maintain views required to ensure force protection measures. Large evergreen trees are discouraged in these locations because they may obstruct sightlines and impact the need for force protection. Adequate lines of sight must be maintained fro guard personnel to observe vehicular and pedestrian traffic approaching the gate.

10.5.2.10 **Zeroscaping**. Where appropriate, to conserve water and lower maintenance consider zeroscaping.

10.5.2.11 **Xeriscape.** Xeriscape is the conservation of water and energy through creative and adaptive landscape design. Xeriscape landscapes provide attractive solutions that save money, water, and maintenance. The following website provides guidance on specific design principles of the xeriscape design process and xeriscape design application:

- USAF Landscape Design Guide, Xeriscape

10.6 PLANT MATERIAL SELECTION

10.6.1 Trees, shrubs, ground cover and turf are the major elements of a planting composition. Basic plant selection criteria should consider creating a unified composition utilizing native materials for low maintenance and sustainability, avoiding incompatible colors, textures and forms, and matching the appropriate plant to the land use, situation and environmental condition.

10.6.2 The ability of plant material to provide lasting benefit is dependent upon the plant's hardiness and its appropriateness to the site use. Major factors affecting plant hardiness are soil type and organic content, temperature, moisture and light. These climatic conditions can be modified to an extent by specific site conditions, such as wind protection, solar orientation and planting design, to create microclimates.

Plant Categories

Cultural Characteristics

Growth Rate-Rapid

Growth Rate-Medium

Growth Rate-Slow

Disease/Pest Resistance

Environmental Characteristics

Acidic Soil Tolerant

Alkaline Soil Tolerant

Dry Soil Tolerant

Moist Soil Tolerant

Poor/Rocky Soil Tolerant

Salt Tolerant

Shade Tolerant

Summer Wind Tolerant

Urban Condition Tolerant

Ornamental Characteristics

Blue Flowers

Ornamental Bark

Fig. 10.13 - Plant Categories

10.6.3 Selecting appropriate plants for a given condition is only one aspect of planting design. Compositional arrangement to provide texture variety and to accent site and building features is another. The selection and composition of a planting design requires an understanding of each plant's characteristics, form, and environmental needs as well as how each plant can relate to and complement other plants in the design. Plants are used in four basic design categories (Fig 10.13):

- Canopy
- Barrier
- Screen (or Baffle)
- Groundcover

10.7 PLANT PALETTE AND PLANT CATEGORIES

10.7.1 The plant palette and categories are designed to help the designer choose the best plant for each particular set of design requirements. The plants that appear on the palette and in the categories were selected for their hardiness and their ability to survive in this geographical area. To use them effectively, the design requirements must be well defined for the specific site.

10.7.2 The Plant Palette.

10.7.2.1 A select group of plant materials has been divided into the following six categories:

- deciduous trees
- coniferous trees
- deciduous shrubs
- coniferous shrubs
- broadleaf evergreen shrubs
- groundcover and vines

10.7.2.2 On the palette, the plants appear in alphabetical order by their botanical name, followed by their common

Plant Categories Cont.

Ornamental Characteristics

Pink/Purple Flowers

Red/Crimson Flowers

White/Cream Flowers

Yellow/Orange Flowers

Yellow/Orange/Red Fall Color

Functional Characteristics

Erosion Control/Bank Stabilizer

Foundation Plants

Large Hedges (+25')

Medium Hedges (10-20')

Low Hedges (4-10')

Naturalizing/Conservation

Park Trees

Large Street Trees (+35')

Small Trees (15-35')

Thorny Plants

Fig. 10.13 - Plant Categories

name, design characteristics, cultural information, recommended use and miscellaneous notes. The plant palette is presented in a matrix format in Appendix O.

10.7.3 The Plant Categories.

10.7.3.1 Plants from the plant palette with similar characteristics have been cataloged in the Plant Categories (Fig. 10.13). These characteristics could be cultural (e.g., upright, narrow form), environmental (e.g., shade tolerant), ornamental (e.g., red fall color), or functional (e.g., screening plant). Characteristics include: Cultural Conditions (mature height and spread, form and growth rate, disease and pest resistance), Environmental Conditions (sun/shade, pH range, soil moisture required, and wind/sun), and Ornamental Characteristics (flower color, autumn color, fruit color, and/or summer leaf color).

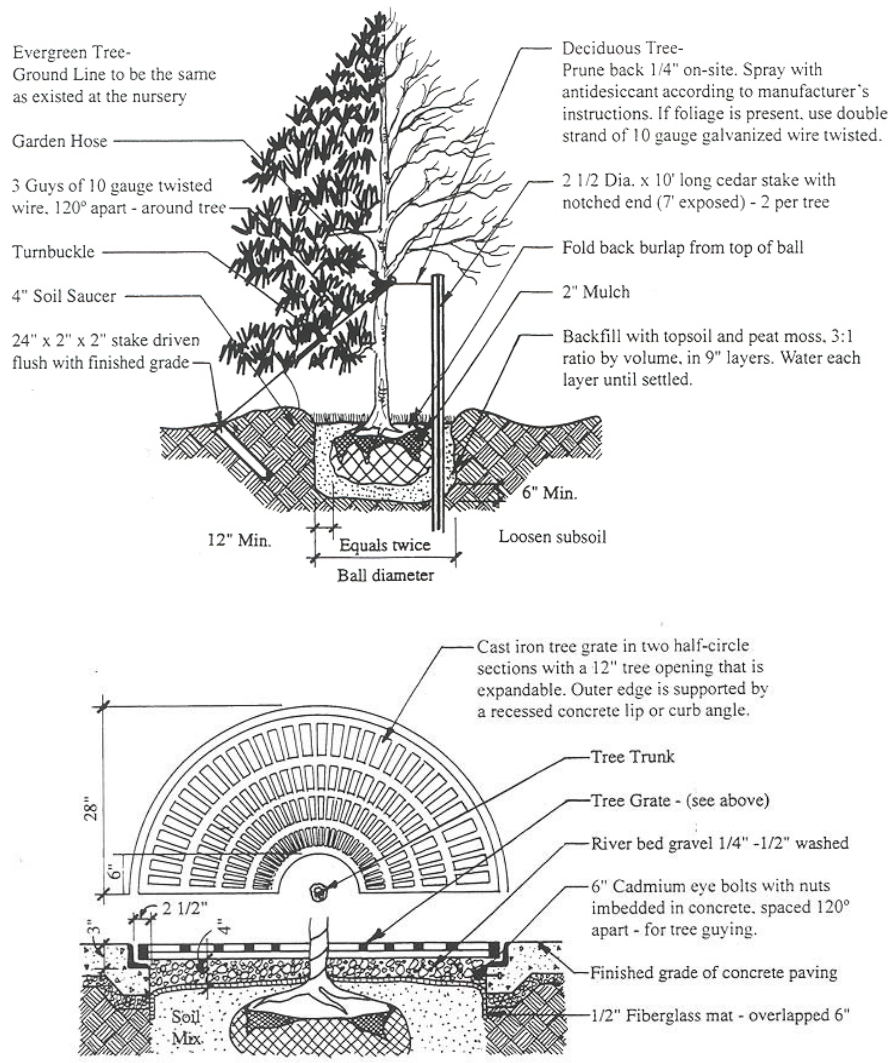


Fig. 10.14 - Install Plant Material According to Industrial Standards

10.7.3.2 Each category describes a list of plants that share a similar quality. For example, materials that are shade tolerant would be placed in the Shade Tolerant group under the "Environmental Conditions" heading. To further explain the Categories, under the "Environmental Conditions" heading, in the Shade Tolerant group, all shade tolerant deciduous

trees would be listed under “Deciduous Trees"; all shade tolerant Coniferous trees would be listed under "Coniferous Trees"; and so on.

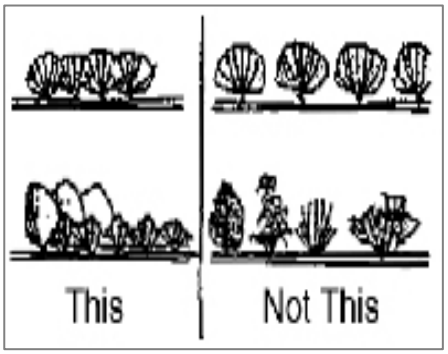


Fig. 10.15 – Space Plants According to their Mature Size

10.8 PLANT MATERIAL INSTALLATION

10.8.1 A key step in assuring successful planting is to select plants of the highest quality. Plant material should be of the size, genus, species, and variety to comply with the recommendations and requirements of the "American Standard for Nursery Stock" ANSI Z60.1.

10.8.2 As part of the design process and prior to plant installation, review the installation's Master Plans, Basic Information Maps or As Built Drawings for utility locations and verify with the Directorate of Public Works or equivalent.

10.8.3 The planting and establishment of trees, shrubs, ground covers, and vines is detailed in TM 5-803-13, Chapter 3.

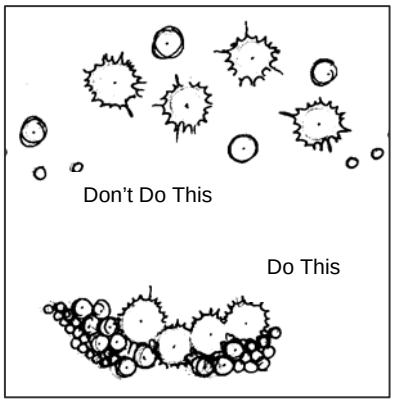


Fig. 10.16 – Grouped Plants Have Greater Impact

10.8.4 General Guidelines for Plant Installation.

10.8.4.1 At planting time, thin plants by removing one-third of the vegetative material.

10.8.4.2 Spray all evergreens with an antidesiccant within 24 hours of planting.

10.8.4.3 Water all plants thoroughly during the first 24-hour period after planting.

10.8.4.4 Site all plants and stakes plumb.

10.8.4.5 Space plants according to their mature size (Fig. 10.X).

10.8.4.6 Install plant materials in groups for greater impact (Fig. 10.17).

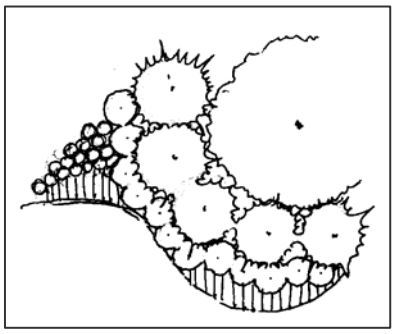


Fig. 10.17 – Group Plants in Mulched Beds to Reduce

10.8.4.6 Installation of Lawn Areas.

10.8.4.7 Installation techniques for turf is detailed in TM 5-803-13, Chapter 4. The details include site evaluation, site

preparation, selection of turf, and maintenance requirements.

10.9 MAINTENANCE OF PLANT MATERIAL

10.9.1 The ease of maintenance should be one of the primary goals when considering the success of any planting design.

10.9.2 Pruning. In general plant material should be allowed to conform to its natural shape. This practice allows the plant to mature in a health manner, and saves the time and energy required for trimming. The pruning of trees and shrubs is done to maintain overall plant health, direct plant growth, maintain a desired shape, and increase flower or fruit development.

10.9.2.1 Pruning Shrubs.

- Do not prune shrubs flat across the top.
- Prune branches yearly on thick-branched shrubs and at the base of the shrub.
- When pruning deciduous shrubs prune shrub stems as close to the ground as possible and shrub branches as close to the stem as possible.
- When "thinning out" deciduous shrubs prune about one-third of all branches where they meet their main stem.

10.9.2.2 Pruning Trees.

- Remove a large limb by making three cuts as follows:
- Make the first cut at the bottom of the branch 12-24" from the branch attachment (Cut A, Fig 10.18).
- Make the second cut on the top of the branch within 1" of the undercut (Cut B, Fig 10.18).
- Make the final cut just beyond the outer portion of the branch collar (Cut C, Fig 10.18). The first two

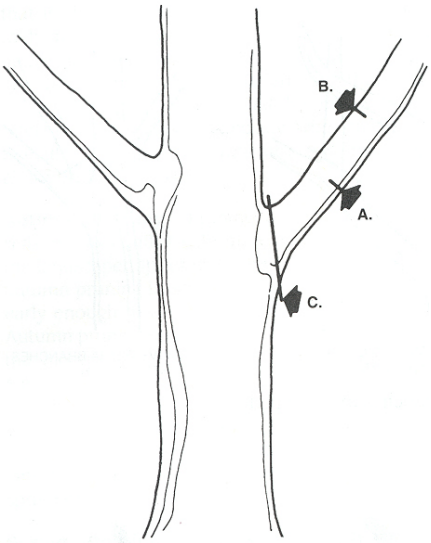


Fig. 10.18 - Proper Tree Pruning Procedures

cuts were necessary to remove the weight of the branch to allow cut #3 to be clean without ripping the bark.

- Never cut the central leader of the tree.
- Coniferous evergreens trees should be pruned, during the spring, by snipping off new growth. Avoid geometrically shaping plant material while pruning.

10.9.3 Mulching.

- Use mulch around the base of plant material to provide for greater moisture and help inhibit the growth of weeds and grasses. Mulch should be maintained at a depth of two (2) to four (4) inches.

- The best time to mulch for water conservation is in the late spring. Apply mulch immediately to new fall plantings.

10.9.4 Ground Cover Maintenance. Although ground covers do not require pruning, they may be periodically dug up in the spring or fall for propagation and to prevent overcrowding in their beds.

10.9.5 Landscape Maintenance Schedule. The general objective of a landscape maintenance schedule is to ensure an orderly and efficient care of the grounds. The landscape maintenance schedule included in the Installation Design Guide (See Appendix F.) identifies times throughout the year when specified maintenance should be undertaken. Use of the landscape maintenance schedule will improve all aspects of landscape on the installation. Materials and supplies can be ordered in a timely fashion, manpower needs can be calculated and anticipated, and a correlation between the level of maintenance and appropriate cost can be derived.

10.10 TREE PROTECTION AND PRESERVATION

10.10.1 Existing urban trees and forest should be preserved if they are in good health. Construction should be planned to provide for the preservation of significant trees.

10.10.2 During the clearing and construction process, trees should be protected from damage. Construction barricades should be erected to protect the existing trees to be preserved. The barricades should be no closer to the trunk of the tree than one-half the distance form the trunk to the drip line. Existing trees that cannot be preserved should be considered for transplanting to a different location on site or to a different site.

10.10.3 Changes in the grade of the soil around trees can cause extensive root damage and eventually death of the tree. To prevent damage to the tree, it is important to maintain the existing grade for least the size of the threes canopy. (the drip line) (Fig. 10.19).

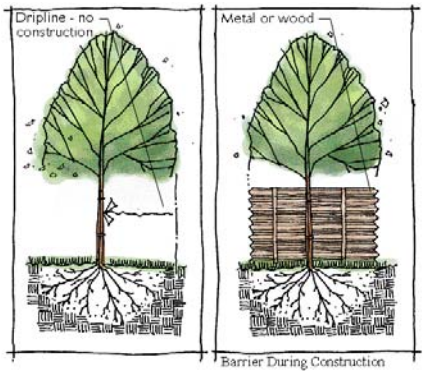


Fig 10.19 - Construct a Barrier at Drip Line During Construction to Maintain Grade

10.11 ANTI-TERRORISM/FORCE PROTECTION CONSIDERATIONS

10.11.1 The presence of vegetation on an installation can have both beneficial and detrimental impacts on security. The selection and placement of landscape plant material on Army installations is an integral element in the provision of protective measures to reduce the threat of terrorism.

10.11.2 Proper selection and placement of trees and shrubs can be utilized to provide visual screening without creating concealment for covert activity. The landscape architect responsible for tree placement should work closely with installation force protection experts to design a landscape plan that provides visual screening without compromising Antiterrorism measures (Fig. 10.20).

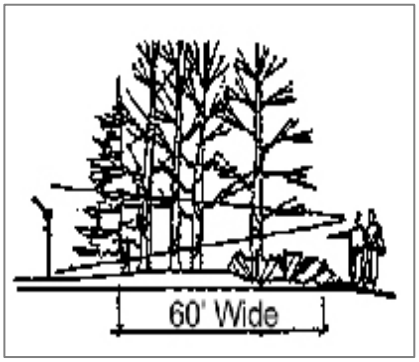


Fig. 10.20 – Establish a Visual Barrier in Perimeter Setback

10.11.3 The plant material must allow building occupants to see out, but must not allow outside forces to monitor interior activity. The landscape architect should incorporate the following aspects into the design:

- Avoid conditions within 10 meters (33 feet) of inhabited structures that permit concealment of aggressors or obscure the view of objects or packages 150-millimeters (6 inches) in height from the view of security personnel. This results in the placement of shrubs and trees that are

loose rather than dense in growth habit and possess multiple small stems rather than a single trunk that will obscure a 150 mm (6 inch) package.

- Vegetation groupings provide reduction of blast effect.
- Plant material selection and placement shall minimize potential hiding places for bombs and aggressors.
- Provide vegetation screens for play areas and outdoor recreation areas to obscure from off-installation view.
- Use trees to obscure sight lines of on-installation buildings from off-installation buildings (Fig. 10.21).

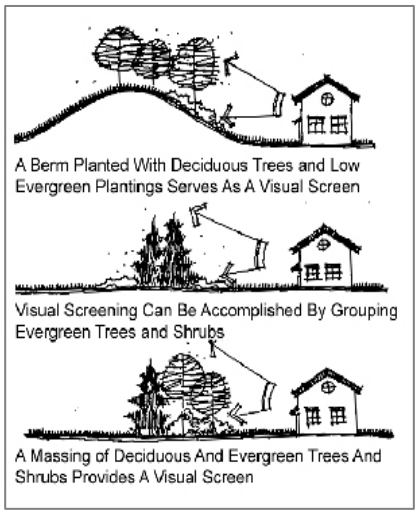


Fig. 10.21 – Use Trees to Obscure Sight Lines

10.12 ARMY STANDARDS

10.12.1 The cited Army Standards shall be met.

- Army Regulation (AR) 420-70, *Buildings and Structures*
- Technical Manual (TM) 5-630, *Natural Resources Land Management*
- Technical Manual (TM) 5-803-13, *Landscape Design and Planting*
- American Standard for Nursery Stock, ANSI Z60.1
- Overseas (Host Nation Standards)

10.13 REFERENCES

10.13.1 The following references are provided for guidance.

- Unified Facilities Criteria (UFC) *2*-600-01, *Installation Design,* Chap 10
- USAF Landscape Design Guide
- C. Brickell and D. Joyce. *Pruning and Training,* 1996.

Links

Go to Section 11

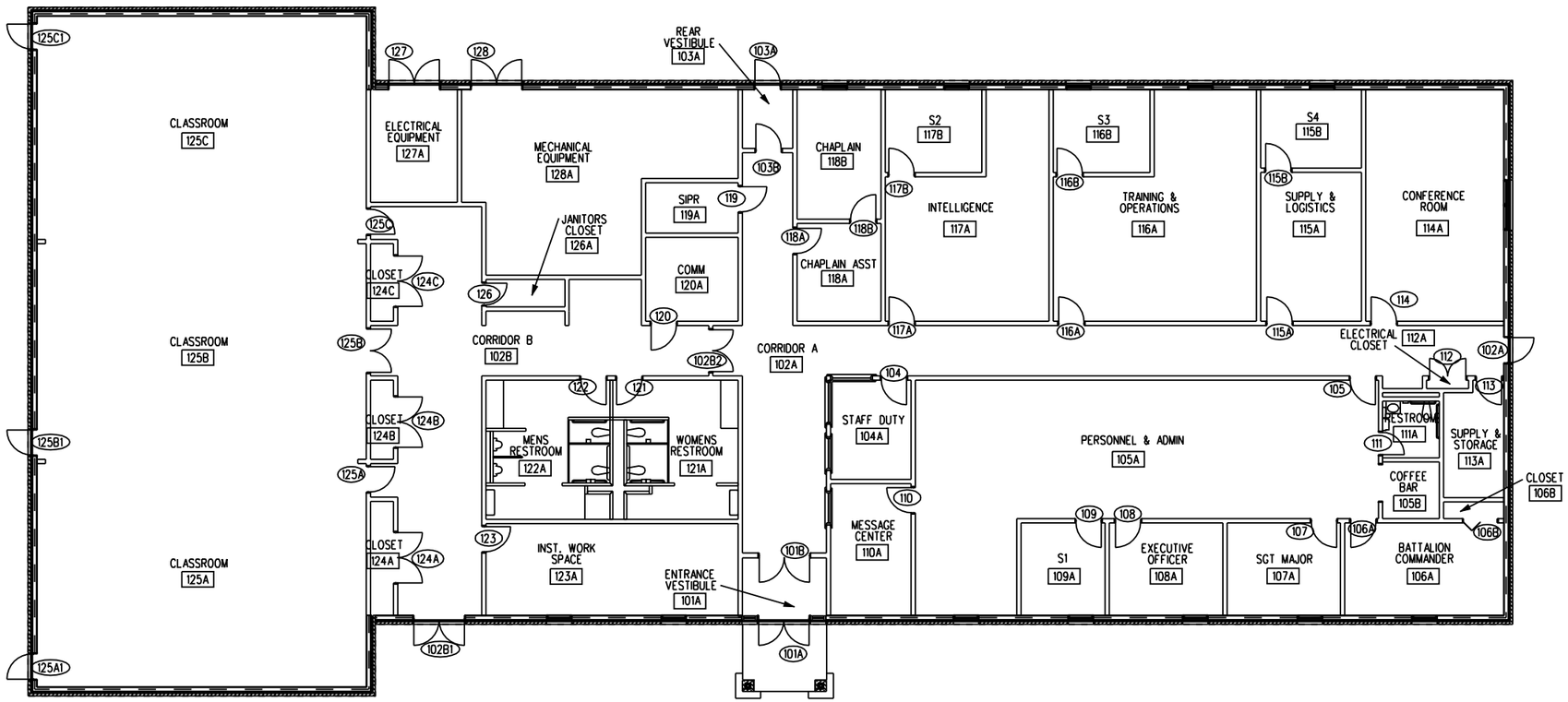
Go to Table of

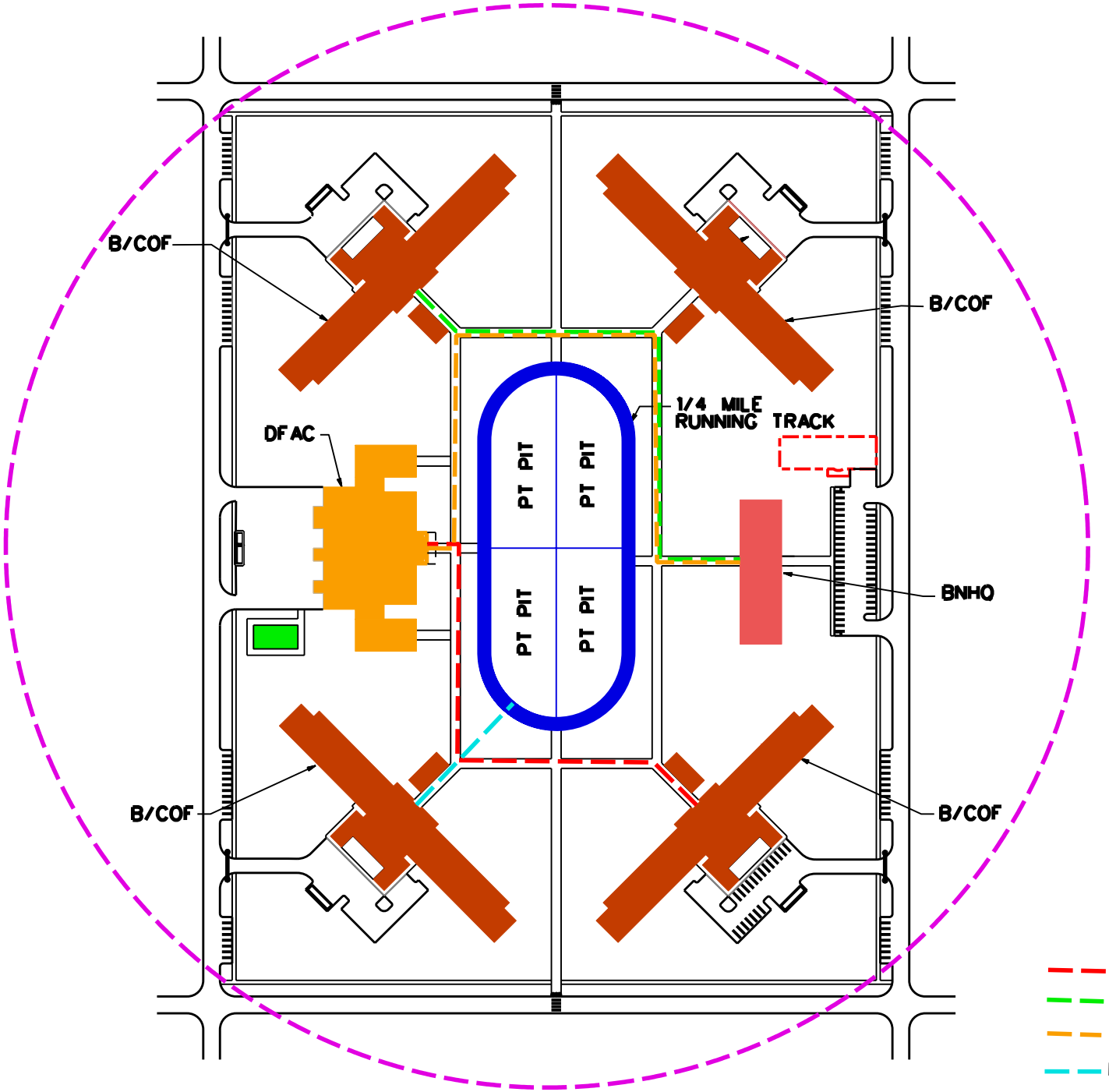
ATTACHMENT A
BATTALION HEADQUARTERS FACILITY AND COMPLEX DETAILS

Index

- **BATTALION HEADQUARTERS (BNHQ) FLOORPLAN**
- **ESTABLISHED TRAVEL DISTANCES BETWEEN FACILITIES IN COMPLEX**

US Army Corps of Engineers
Fort Worth District





ADVANCED INDIVIDUAL TRAINING (AIT) COMPLEX

(34 Acres As Shown)

DISTANCE LEGEND

- B/COF to DFAC 787' (3.3 min.)
- B/COF to BNHQ 881' (3.7 min.)
- BNHQ to DFAC 1171' (4.9 min.)
- B/COF to PT PITS 215' (0.9 min.)
- 1680' RECOMMENDED MAXIMUM DISTANCE BETWEEN B/COF AND OTHER FACILITIES (10 min. from a 3 Story Facility)

Appendix K

Fuel Cost Information

IMSW-SIL-RMO

29 December 2008

MEMORANDUM FOR Fort Sill Utility and Refuse Customers

SUBJECT: Change of Utility Rate Schedule

1. In compliance with United States Army Center for Public Works, Technical Note 420-41-1, the required annual review of utility cost to the government has been completed. The revised rate will be in effect on your January billing.

2. The FY09 rates are calculated from receipt of FY08 cost experience and completion of year-end reporting. In the event that the rates need to be re-evaluated due to the local market a notice will be sent out immediately.

3. The following rates supersede the rates set forth on all past contract modifications or basic contracts.

	A rate	B rate	H rate
Electric	.0611 per KWH	.0641 per KWH	.0493 per KWH
Gas	11.9083 per MCF	12.5037 per MCF	11.4720 per MCF
Water	6.1173 per KGAL	6.4232 per KGAL	5.7580 per KGAL
Sewage	5.3188 per KGAL	5.5848 per KGAL	4.2420 per KGAL
Refuse	.0419 per LB	.0471 per LB	

Refuse Rate A per Ton	$83.87
Refuse Rate B per Ton	$94.18

4. The (A) rate is the cost to the government including operation, privatization and maintenance costs plus losses/infiltration in transmission. Chargeable to other Federal Government activities; applicable DMWR activities and commissaries.

5. The (B) rate is the cost to the government including operation, privatization and maintenance cost, losses/infiltration in transmission, capital charges, and administrative overhead. Chargeable to on post non-federal government activities, lessees of industrial facilities, contractors (MCA, OMA, RDT&E), and direct sales concessionaires. Rate B is also chargeable to off-post non-federal government activities when it is greater than the prevailing rate (LPR) applicable to the customer class.

6. The (H) rate is the cost to the government including normal operation, privatization and maintenance costs plus losses/infiltration in transmission. The maintenance cost excludes major one-time or non-recurring cost maintenance and repair projects (abnormal maintenance). Rate H is chargeable to Army Family Housing and Government employees renting Government quarter's on-post.

7. Point of contact for this action is Kolby Seals (580) 442-3267, IMCOM-RMO, Budget and Accounting Division, Garrison Resource Management Office.

Randall J. Butler

RANDALL J. BUTLER, P.E.
Director of Public Works

APPENDIX L

LEED Project Credit Guidance (MAY 10)

This spreadsheet indicates Army required credits, Army preferred credits, project-specific ranking of individual point preferences, assumptions guidance for individual credits, and references to related language in the RFP for individual credits.

LEED Credit Paragraph	LEED Project Credit Guidance	**Army Guidance:** Required - Preferred - Avoid	**Project Preference Ranking**: (1=most preferred, blank=no preference, X=preference not applicable to this credit, Rqd=required)	
PAR	**FEATURE**			**REMARKS**
SUSTAINABLE SITES				
SSPR1	Construction Activity Pollution Prevention (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
SS1	Site Selection		X	See paragraph LEED CREDITS COORDINATION.

SS2	Development Density & Community Connectivity - OPTION 1 DENSITY		X	See paragraph LEED CREDITS COORDINATION.
	Development Density & Community Connectivity - OPTION 2 CONNECTIVITY		X	See paragraph LEED CREDITS COORDINATION.
SS3	Brownfield Redevelopment		X	See paragraph LEED CREDITS COORDINATION.
SS4.1	Alternative Transportation: Public Transportation Access		X	See paragraph LEED CREDITS COORDINATION.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	Pref		Assume that non-transient building occupants are NOT housed on Post unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1			Requires provision of vehicles, which cannot be purchased with construction funds. Assume Government will not provide vehicles unless indicated otherwise. Assume that 50% of GOV fleet is NOT alternative fuel vehicles unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	Pref		
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3			Requires provision of vehicle refueling stations. Installation must support type of fuel and commit to maintaining/supporting refueling stations.
SS4.4	Alternative Transportation: Parking Capacity	Pref		

SS5.1	Site Development: Protect or Restore Habitat			
SS5.2	Site Development: Maximize Open Space	Pref		Assume AGMBC option for aggregated open space at another location on the installation is not available to the project unless indicated otherwise.
SS6.1	Stormwater Design: Quantity Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS6.2	Stormwater Design: Quality Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS7.1	Heat Island Effect: Non-Roof			
SS7.2	Heat Island Effect: Roof	Pref		Coordinate with nearby airfield requirements, which may preclude this credit.
SS8	Light Pollution Reduction	Pref		
WATER EFFICIENCY				
WEPR1	Water Use Reduction (Version 3 only)	Rqd	Rqd	All LEED prerequisites are required to be met.
WE1.1	Water Efficient Landscaping: Reduce by 50%	Pref		See paragraph IRRIGATION. Project must include landscaping to be eligible for this credit.
WE1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	Pref		Project must include landscaping to be eligible for this credit.
WE2	Innovative Wastewater Technologies - OPTION 1			
WE2	Innovative Wastewater Technologies - OPTION 2			
WE3	Water Use Reduction	Pref		See paragraph BUILDING WATER USE REDUCTION.

ENERGY AND ATMOSPHERE				
EAPR1	Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR2	Minimum Energy Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EA1	Optimize Energy Performance	Rqd	1	Earning of LEED EA1 points as indicated in paragraph ENERGY CONSERVATION, as a minimum, is required.
EA2.1	On-Site Renewable Energy	Pref		See paragraph ENERGY CONSERVATION.
EA3	Enhanced Commissioning	Rqd		See paragraph COMMISSIONING. The Commissioning Authority may be provided through the Design-Build Contractor only if in accordance with USGBC Credit Interpretation Ruling (CIR) dated 9/15/06. Commissioning Authority activities begin during design phase and continue well beyond beneficial occupancy. Assume Government will not provide CxA post-occupancy activities unless indicated otherwise.
EA4	Enhanced Refrigerant Management			
EA5	Measurement & Verification			Assume Government will not provide post-occupancy activities unless indicated otherwise.
EA6	Green Power		X	See paragraph LEED CREDITS COORDINATION.

MATERIALS AND RESOURCES				
MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Coordinate with Installation during design development on collection service and receptacles.
MR1	Building Reuse			
MR2.1	Construction Waste Management: Divert 50% From Disposal	Pref		See paragraph CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
MR2.2	Construction Waste Management: Divert 75% From Disposal	Pref		
MR3	Materials Reuse			
MR4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Pref		See paragraph RECYCLED CONTENT.
MR4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Pref		
MR5.1	Regional Materials:10% Extracted, Processed & Manufactured Regionally			
MR5.2	Regional Materials:20% Extracted, Processed & Manufactured Regionally			

MR6	Rapidly Renewable Materials	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS and paragraph FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM.
MR7	Certified Wood	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS.
INDOOR ENVIRONMENTAL QUALITY				
EQPR1	Minimum IAQ Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Assume all buildings are smoke free unless indicated otherwise (family housing, barracks and other lodging are facility types where smoking may be permitted in some cases).
EQ1	Outdoor Air Delivery Monitoring			
EQ2	Increased Ventilation			
EQ3.1	Construction IAQ Management Plan: During Construction	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ4.1	Low Emitting Materials: Adhesives & Sealants	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.2	Low Emitting Materials: Paints & Coatings	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	Pref		See paragraph LOW-EMITTING MATERIALS.

EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ5	Indoor Chemical & Pollutant Source Control	Pref		System requiring weekly cleaning to earn this credit is not a permitted option unless indicated otherwise.
EQ6.1	Controllability of Systems: Lighting			
EQ6.2	Controllability of Systems: Thermal Comfort			
EQ7.1	Thermal Comfort: Design	Rqd		See paragraph HEATING, VENTILATING AND AIR CONDITIONING.
EQ7.2	Thermal Comfort: Verification			Project must earn credit EQ7.1 to be eligible for this credit. Assume Government will not provide post-occupancy activities unless indicated otherwise.
EQ8.1	Daylight & Views: Daylight 75% of Spaces	Pref		See paragraph DAYLIGHTING.
EQ8.2	Daylight & Views: Views for 90% of Spaces	Pref		
INNOVATION & DESIGN PROCESS				
IDc1.1	Innovation in Design			See paragraph INNOVATION AND DESIGN CREDITS. Assume Government will not provide any activities associated with ID credits.
IDc1.2	Innovation in Design			
IDc1.3	Innovation in Design			
IDc1.4	Innovation in Design			
IDc2	LEED Accredited Professional	Rqd	Rqd	LEED AP during design and construction is required.
REGIONAL PRIORITY CREDITS (Version 3 only)				See paragraph LEED CREDITS COORDINATION.

*AM1 APPENDIX M

LEED OWNER'S PROJECT REQUIREMENTS*

Added by Am 0001

Owner's Project Requirements Document for LEED Fundamental Commissioning

Project: AIT Complex PH1 PN58531

Approved: _____ _____ _____
Name Ow ner's Representative Date

_____ _____ _____
Name Design Agent's Representative Date

Overview and Instructions

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The Owner's Project Requirements Document is a required document for LEED Version 3.0 EA Prerequisite 1, Fundamental Commissioning of the Building Energy Systems. It shall be completed by the Corps District/Design Agent based on coordination with the Installation/User/Proponent and shall be approved by the Installation/User/Proponent representative.

Use of this template is not required, nor are there any restrictions on editing of it. It is provided simply as a tool to assist project teams in meeting the documentation requirements for LEED Fundamental Commissioning.

The intent of the Owner's Project Requirements Document, per the LEED v3.0 Reference Guide, is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. This template contains the basic recommended components indicated in the LEED v3.0 Reference Guide. It should be adapted as needed to suit the project, remaining reflective of the LEED intent.

The Owner's Project Requirements Document should ideally be completed before the start of design and furnished to the design team. It must be completed prior to the approval of Contractor submittals of any commissioned equipment or systems to meet LEED requirements.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Corps District/Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

The Owner's Project Requirements Document shall be included in the project's LEED documentation file under EA PR1, Fundamental Commissioning of the Building Energy Systems.

Owner's Project Requirements Document for LEED Fundamental Commissioning

Table of Contents

1. Owner and User Requirements
   - Primary Purpose, Program and Use
   - Project History
   - Broad Goals
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   - General
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   - Building Envelope
   - Roof
   - Other
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5. Building Occupant and O&M Personnel Requirements
   - Facility Operation
   - EMCS
   - Occupant Training and Orientation
   - O&M Staff Training and Orientation

TABLE 1

1. *Owner and User Requirements*

What is the primary purpose, program and use of this project? (example: office building with data center)

Advanced Individual Training; Billeting; Company Operations; and Battalion HQ for the Fires Center of Excellence Field Artillery School.

Describe pertinent project history. (example: standard design development)

This is a standard design complex that includes Barracks, Company Operations, and Battalion HQ in the first phase; and the remaining Barracks and Company Operations, and Dining Facility in the second phase (PN75953 in FY15)

Broad Goals

What are the broad goals relative to program needs?

To provide economical, standardized facilities that meet the basic functional needs of units.

What are the broad goals relative to future expansion?

No provision for future expansion is needed.

What are the broad goals relative to flexibility?

Open, flexible design for admin offices. Ability to subdivide sleeping bays to accommodate gender ratio variations.

What are the broad goals relative to quality of materials?

Trainee spaces receive very heavy use. Company level interior spaces are not plush, receive a good deal of muddy boot travel, and need to be easy to keep clean. Maximum durability within budget.

What are the broad goals relative to construction costs?

Facility must meet budget.

What are the broad goals relative to operational costs?

Meet EPACT 05 & EISA 2007 (reduced water, energy consumption). Minimize operating costs as much as possible within first cost budget.

What are the broad goals relative to life cycle of the equipment?

_____

_____

Other broad goals: *(Insert as applicable)*

To provide essentially the same functional facility at all locations (site-adapt) to the extent possible to facilitate unit mobility and to reduce repetitive design costs.

To reduce construction time to 18 months.

2. Environmental and Sustainability Goals

What are the project goals relative to sustainability and environmental issues? (example: LEED Silver rating)

LEED Silver rating.

What are the project goals relative to energy efficiency? (example: Meet EPACT)

Meet EPACT 05 and EISA 2007.

What are the project goals and requirements for building siting that will impact energy use?

Same facility must be site-adapted nationwide. Consistent building orientation cannot be expected. Variations in availability of fuel sources.

Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

What are the project goals and requirements for building facade that will impact energy use?

Same facility must be site-adapted nationwide. Exterior appearance will vary to be be compatible with adjoining environment's architectural theme.

Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

What are the project goals and requirements for building fenestration that will impact energy use?

Same facility must be site-adapted nationwide. Fenestration will vary to be compatible with adjoining environment's architectural theme. Consistent building orientation cannot be expected. Antiterrorism/Force Protection criteria (UFC 4-010-01) requires laminated glass and heavy duty frame.

What are the project goals and requirements for building envelope that will impact energy use?

ASHRAE 90.1 and EPACT and EISA 2007 are required. Antiterrorism/Force Protection criteria (UFC 4-010-01) requires hardened structure at Covered Training.

Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

What are the project goals and requirements for building roof that will impact energy use?

Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

Other: *(Insert as applicable)*

_____
_____
_____

3. Indoor Environmental Quality Requirements

What is the intended use for all spaces? For all spaces that have an intended use that is not readily apparent from the space name, provide this information in Table 1.

_____
_____
_____

What is the anticipated occupancy schedule (numbers of occupants and time frames) for all occupied spaces? Indicate the default occupancy schedule below and for all spaces that have an occupancy schedule that differs from the default, provide this information in Table 1.

Trainee daily schedule is as indicated in Section 01 10 00 Functional Requirements. Company office may have sporadic after-hour use.

What accommodations for after-hours use are required? (example: access control, lighting controls, HVAC controls) Indicate general accommodations required below and for all spaces that have special requirements, provide this information in Table 1.

Supervised monitoring of building. IDS at arms vault. Lights manually controlled in barracks area. Office areas have automatic lighting controls with manual override as necessary.

What are the lighting, temperature, humidity, air quality, ventilation and filtration requirements for all spaces? Indicate the default requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

Lighting: IESNA Lighting Handbook, IESNA RP-1-04, ASHRAE 90.1 (ASHRAE 90.1 does not apply to residential)
Temperature: See table 5-1 in Section 01 10 00 of RFP

Humidity: 50%
Air Quality: ASHRAE 62.1

Ventilation: ASHRAE 62.1

Filtration: _____

What are the acoustical requirements for all spaces? Indicate the default acoustical requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

As indicated in Section 01 10 0 of RFP.

What is the desired level of occupant ability to adjust systems controls? Indicate the default desired levels below and for all spaces that have a desired level that differs from the default, provide this information in Table 1.

Lighting: On/Off control in sleeping bays. Automatic controls elsewhere. Dimming as indicated in Section 01 10 00 of RFP.

Temperature: No occupant adjustment
Humidity: No occupant adjustment
Air Quality: No occupant adjustment

Ventilation: No occupant adjustment

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)

None

4. Equipment and System Expectations

(Complete for each category as applicable or indicate "none identified" or "N/A". Add desired features information for other anticipated commissioned systems as applicable)

Indicate desired features for the following commissioned system: Space Heating

Desired Type: None Identified

Quality: _____

Preferred Manufacturer: N/A
Reliability: _____
Automation: Automatically controlled through Building Automation System (BAS)

Flexibility: Total building heating load split between two boilers if a central system is utilized
Maintenance Requirements: _____
Efficiency Target: ASHRAE 90.1 + 40% (EPAct05)

Desired Technologies: _____

Indicate desired features for the following commissioned system: Ventilation

Desired Type: None identified

Quality: Comply with ASHRAE 62.1

Preferred Manufacturer: N/A
Reliability: _____
Automation: Automatically controlled through Building Automation System (BAS)

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: Energy Recovery

Indicate desired features for the following commissioned system: Air Conditioning

Desired Type: Non Identified

Quality: High Efficiency

Preferred Manufacturer: N/A
Reliability: _____
Automation: Automatically controlled through Building Automation System (BAS)

Flexibility: See Section 01 10 00 regarding split bays
Maintenance Requirements: _____
Efficiency Target: ASHRAE 90.1 + 40% (EPAct05)

Desired Technologies: Economizer cycle

Indicate desired features for the following commissioned system: Refrigeration

Desired Type: None identified

Quality: _____

Preferred Manufacturer: _____
Reliability: Total building cooling load split between two units if a central system is utilized
Automation: Automatically controlled through Building Automation System (BAS)

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: Comply with ASHRAE 90.1 + 40% (EPAct05)

Desired Technologies:

Indicate desired features for the following commissioned system: HVAC Controls

Desired Type: LonWorks Technology or BacNet

Quality: Must connect to 1 of 2 existing front ends

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility: _____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Domestic Hot Water

Desired Type: None identified

Quality: High Efficiency

Preferred Manufacturer: _____
Reliability: High Efficiency
Automation: Standard Manufacturer's Controls, Return Water Recirculation

Flexibility: _____
Maintenance Requirements: Low
Efficiency Target: Compliant with ASHRAE 90.1 + 40% (EPAct05)

Desired Technologies: Solar w/back up system

Indicate desired features for the following commissioned system: Lighting Controls

Desired Type: As indicated in Section 01 10 00

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: As indicated in Section 01 10 00

Indicate desired features for the following commissioned system: Daylighting Controls

Desired Type: Not required

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Emergency Power

Desired Type: Not required

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility:_____
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

Indicate desired features for the following commissioned system: Other -Plumbing

Desired Type: _____

Quality: _____

Preferred Manufacturer: _____
Reliability: _____
Automation: _____

Flexibility: Tempering valves to handle wide demand fluctuations
Maintenance Requirements: _____
Efficiency Target: _____

Desired Technologies: _____

5. Building Occupant and O&M Personnel Requirements

How will the facility be operated? Who will operate the facility?

By DPW contractor

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)

As indicated in Section 01 10 00

What is the desired level of training and orientation for building occupants to understand and use the building systems?

Minimal for occupants

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?

As indicated in Section 01 78 02.00 10.

Table 1

Space	Use / Activity	Num of Occs	Special Occupancy Schedule	After Hours Use Reqmt.	Special Cooling Reqmt.	Special Heating Reqmt.	Special Humidity Reqmt.	Special Ventil./Filtration Reqmt.	Special Acoustic Reqmt.	Special Lighting Reqmt.	Special Occup Adjustability Reqmt.
Barracks	Sleep/Leisure	300ea		Yes	No	No	No	No	No	No	No
Company Ops	Admin/Ops	10-20		Yes	No	No	**YES**	No	No	No	No
Battalion HQ	Admin/Ops	30-90		Yes	No	No	No	No	No	No	No

Appendix N

LEED Requirements for Multiple Contractor Combine Projects

When site work and building(s) for a project are accomplished by separate contractors, it is referred to as a Combined Project for purposes of LEED scoring and documentation and the following is required:

- LEED points relating to site work must be combined with the LEED points for each building to arrive at a single LEED Combined Project score.
- LEED points having both building requirements and site requirements (combined bldg/site points) must be coordinated between the contractors.
- LEED aggregate materials points must be coordinated between the contractors and a division of responsibilities for each contractor's required contribution to the point must be developed.
- LEED Project documentation from separate contractors must be combined.

Multiple Contractor Combined Project Definition. A summary of the separate projects that constitute the Combined Project may be provided at paragraph SUSTAINABLE DESIGN – ADDITIONAL INFORMATION or may be obtained from the Contracting Officer's Representative. Typical Multiple Contractor Combined Projects are comprised of the site work contract and all the building-only contracts for buildings that the site work is provided for in the separate site work contract.

LEED Points Coordination. This project was registered with the USGBC under LEED-NC v3. The project shall be designed and constructed to achieve LEED Silver certification. See Appendix O LEED Strategy Table(s) for the credits and prerequisites each contractor is responsible for obtaining, for special requirements relating to combined building/site points and for each contractor's requirement relating to aggregate materials points each portion of this Multiple Contractor Combined Project. The Building CTR shall coordinate with the Site CTR and indicate the non site-related credits that will be pursued to meet the desired Silver rating. Each contractor providing a building is referred to as Building CTR and Site CTR refers to the contractor providing the site development. For each building included in the site work contract, the site work contractor is both Building CTR and Site CTR for that building. Aggregate materials percentages indicated in the table(s) are percentage of that contractor's materials total.

Point Substitutions. During preparation of the Proposal, each contractor is free to substitute other LEED points for those indicated in the LEED Strategy Table(s), except points marked "NO" in the "Building CTR Substitutions Permitted" column may not be deleted or added by substitution by building contractor and points marked "NO" in the "Site CTR Substitutions Permitted" column may not be deleted or added by substitution by site contractor. Credit substitutions after award are not permitted except with the advance approval of the Contracting Officer.

LEED Documentation. Each contractor will be provided with project access through LEED Online for credit documentation. Each contractor is responsible for developing all project LEED documentation demonstrating compliance for their portion of the work and must utilize the LEED Letter Templates. Each contractor is responsible for updating construction phase LEED documentation at least monthly until construction closeout. No CTR will duplicate the data of another CTR within their own documentation. Each contractor will include the contractor name, project name and number and individual building description as applicable on each Letter Template. The LEED Letter Templates are copyright protected and shall be used only for this specific contract and this registered project.

Compiling LEED Documentation from Multiple Contractors. At completion and acceptance of final design submittals the completed design phase letter templates and their attachments from all CTRs in the Multiple Contractor Combined Project will be compiled at the registered site project. All CTRs will furnish electronic copies of their completed letter templates and their attachments for this purpose. Monthly during construction and at construction closeout all CTRs current construction phase letter templates and their attachments will be compiled at the registered site project. Summary letter templates for all aggregate credits (see AGMBC for which credits are aggregate credits) will be created and maintained monthly with summary data from all from all CTRs in the Multiple Contractor Combined Project at the registered site project. All CTRs will furnish electronic copies of the current updated templates and their attachments for this purpose monthly and at closeout.

Instructions for Obtaining LEED Letter Templates for Registered Army Standard Designs

General. Contractors providing Army standard design buildings only (site work by another contractor) in a Multiple Contractor Combined project obtain their LEED Letter Templates for the project from the Center of Standardization (COS) for that standard design.

Information You Need to Provide. After award, contact the COS POC indicated below requesting LEED Letter Templates for your project. In your request, indicate the following:

- Project name, location, Contractor name, PN number and contract number.
- Description of building(s) you are responsible for (example: S/M/L COF with detached admin).
- LEED Documentation Responsible Party name, phone number, email contact info.
- Responsible party certification of understanding that Letter Templates furnished by the Government for this project are copyright protected and will not be used for any purposes other than for this project documentation.
- Attach the LEED Registered Project Checklist from conformed proposal which indicates the points the project will earn/contribute to.
- It is recommended that you copy the sample below and revise for your project information.

****

SAMPLE EMAIL REQUEST:

To: (COS POC below)
CC: (Contracting Officer's Representative (COR) for your contract)
Subject: COS LEED Letter Templates Request

We have an awarded contract and request COS LEED Letter Templates for:

Project: Advanced Individual Trainee (AIT) Complex
Location: Fort Sill, OK
Contractor: Great Design Builder Inc.
Project Number/Contract Number: PN 58531, W912BV-10-R-20XX
Standard Design Building Type(s): Battalion HQ

Our **Responsible Party** for LEED Documentation for this project is (name, phone number, email).

Certification: I, (sender name), certify that the LEED Letter Templates furnished by the Government for this project are copyright protected and I will ensure that they are not used for any purpose other than project documentation for this project only.

Attached Checklist: Please see attached LEED Project Checklist, which indicates the points this project will earn.

Salutation,
Name

****

COS Points of Contact for Obtaining Letter Templates. Email your request to the applicable POC indicated below. If there is no POC indicated for the standard design you are providing, contact your project COR for direction.

Army Standard Design	Point of Contact
Army Family Housing	LisaABobotas@usace.army.mil
Battalion Headquarters	judith.f.milton@usace.army.mil
Brigade Headquarters	judith.f.milton@usace.army.mil
Company Operations Facilities (COF)	judith.f.milton@usace.army.mil
Criminal Investigation Facilities	Matthew.C.Scanlon@usace.army.mil
Enlisted Personnel Dining Facilities	DavidAGary@usace.army.mil
General Instruction Buildings/Classroom XXI	Huong.M.Huynh@usace.army.mil
Military Entrance Processing Stations	LisaABobotas@usace.army.mil
Tactical Equipment Maintenance Facilities (TEMF)	judith.f.milton@usace.army.mil
Transient Officer's Quarters (part of ORTC)	paul.m.kai@usace.army.mil

Furnishing Completed Documentation to COS Letter Template Library. Certain completed design phase letter templates with attachments may be requested by the COS for future use as part of the standard design. If requested, provide an electronic copy to the COS Point of Contact indicated above. The Center of Standardization (COS) for individual Army standard designs may maintain a library of completed LEED documentation for that standard design. The Government will make the completed templates available to subsequent standard design projects in order to reduce duplication of documentation effort to the extent possible. To inquire about reviewing or obtaining completed LEED documentation that may be applicable to a particular project, contact the Center of Standardization POC.

Appendix O

LEED Strategy Tables

LEED Credit Paragraph	**LEED Multiple Contractor Responsibilities Table**	Building CTR Substitution Permitted	Site CTR Substitution Permitted	**Required Points Strategy**	NIC=Not in Contract N/A=Not Applicable R=Required
BUILDING: TACTICAL EQUIPMENT MAINTENANCE FACILITIES					
PAR	**FEATURE**				**REMARKS**
CATEGORY 1 – SUSTAINABLE SITES					
SSPR1	Construction Activity Pollution Prevention (PREREQUISITE)	NIC	NO	R	Site CTR is primary permittee. Building CTR is secondary permittee to primary permittee.
SS1	Site Selection	NIC	NO	1	Site complies - Site CTR responsible.
SS2	Development Density & Community Connectivity	NIC	NO	5	At least 10 basic services and housing with 10 units/acre available within 1/2 mile radius - Site CTR responsible.
SS3	Brownfield Redevelopment	N/A	N/A	0	Not applicable to project site.
SS4.1	Alternative Transportation: Public Transportation Access	N/A	N/A	0	No public transportation available at this time.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	NO	NO	1	Combined Bldg/Site credit. Site CTR responsible for bicycle storage. Building CTR responsible for shower/changing rooms.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1	N/A	N/A	?	Site CTR responsible. OPTION 2 is more feasible.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	NIC	NO	3	Provide designated parking - Site CTR responsible.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3	N/A	N/A	?	Combined Bldg/Site credit. OPTION 2 is more feasible.
SS4.4	Alternative Transportation: Parking Capacity	NIC	NO	2	Meet minimum zoning codes and provide designated parking - Site CTR responsible.
SS5.1	Site Development: Protect or Restore Habitat	N/A	N/A	0	Not applicable to project site.
SS5.2	Site Development: Maximize Open Space	NIC	NO	1	Provide open space equal to building footprint - Site CTR responsible.
SS6.1	Stormwater Design: Quantity Control	NIC	YES	?	Strategy includes stormwater detention pond - Site CTR responsible.
SS6.2	Stormwater Design: Quality Control	NIC	YES	1	Stategy includes stormwater detention pond - Site CTR responsible.
SS7.1	Heat Island Effect: Non-Roof	NIC	YES	?	Building CTR responsible for 100% reflective pavement (concrete meets requirement). Site CTR responsible for ensuring balance of paving in combined project results in 50% compliant when added to TEMF paving. Not achievable with current amount of asphalt paving.
SS7.2	Heat Island Effect: Roof	YES	NIC	1	Building CTR responsible.
SS8	Light Pollution Reduction	NO	NO	1	Combined Bldg/Site credit. Building CTR responsible for building lighting rqmts. Site CTR responsible for site lighting rqmts.
CATEGORY 2 – WATER EFFICIENCY					
WEPR1	Water Use Reduction (PREREQUISITE)	NO	NIC	R	Building CTR responsible.
WE1.1	Water Efficient Landscaping: Reduce by 50%	NIC	YES	2	Site CTR responsible.
WE1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	NIC	YES	?	Site will require minimum irrigation - Site CTR responsible.

LEED Credit Paragraph	**LEED Multiple Contractor Responsibilities Table**	Building CTR Substitution Permitted	Site CTR Substitution Permitted	**Required Points Strategy**	NIC=Not in Contract N/A=Not Applicable R=Required
BUILDING: TACTICAL EQUIPMENT MAINTENANCE FACILITIES					
PAR	**FEATURE**				**REMARKS**
WE2	Innovative Wastewater Technologies - OPTION 1	YES	YES	?	No recycled water system for sewage conveyance at this time - Proposed credit must be coordinated with other CTR.
WE2	Innovative Wastewater Technologies - OPTION 2	NIC	YES	?	No on-site wastewater treatment at this time.
WE3	Water Use Reduction	YES	NIC	?	Building CTR responsible.
CATEGORY 3 – ENERGY AND ATMOSPHERE					
EAPR1	Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	NO	NO	R	Building CTR responsible for commissioning of building systems. Site CTR responsible for commissioning of site systems.
EAPR2	Minimum Energy Performance (PREREQUISITE)	NO	NIC	R	Building CTR responsible.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	NO	NIC	R	Building CTR responsible.
EA1	Optimize Energy Performance	YES	NIC	6	Building CTR responsible. Must comply with EPACT. Up to 19 points possible.
EA2	On-Site Renewable Energy	YES	NO	?	Proposed credit must fall within CTR scope or be coordinated with other CTR. Up to 7 points possible.
EA3	Enhanced Commissioning	NO	NO	2	Third party CxA can not be hired by Building CTR - coordination required.
EA4	Enhanced Refrigerant Management	YES	NIC	?	Building CTR responsible.
EA5	Measurement & Verification	NO	NIC	3	Building CTR responsible.
EA6	Green Power	YES	NIC	?	Building CTR responsible.
CATEGORY 4 – MATERIALS AND RESOURCES					
MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	NO	NIC	R	Building CTR responsible.
MR1	Building Reuse	N/A	N/A	0	Not applicable - new construction.
MR2.1	Construction Waste Management: Divert 50% From Disposal	NO	NO	1	Aggregate credit - Building CTR must coordinate with Site CTR.
MR2.2	Construction Waste Management: Divert 75% From Disposal	NO	NO	1	Aggregate credit - Building CTR must coordinate with Site CTR.
MR3.1	Materials Reuse: 5%	YES	NIC	?	Building CTR responsible. Coordinate with Site CTR .
MR3.2	Materials Reuse: 10%	YES	NIC	?	Building CTR responsible. Coordinate with Site CTR .
MR4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	NO	NO	1	Aggregate credit - Building CTR must coordinate with Site CTR.

LEED Credit Paragraph	**LEED Multiple Contractor Responsibilities Table**	Building CTR Substitution Permitted	Site CTR Substitution Permitted	**Required Points Strategy**	NIC=Not in Contract N/A=Not Applicable R=Required
BUILDING: TACTICAL EQUIPMENT MAINTENANCE FACILITIES					
PAR	**FEATURE**				**REMARKS**
MR4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	YES	YES	?	Aggregate credit - Building CTR must coordinate with Site CTR.
MR5.1	Regional Materials:10% Extracted, Processed & Manufactured Regionally	NO	NO	1	Aggregate credit - Building CTR must coordinate with Site CTR.
MR5.2	Regional Materials:20% Extracted, Processed & Manufactured Regionally	YES	YES	?	Aggregate credit - Building CTR must coordinate with Site CTR.
MR6	Rapidly Renewable Materials	YES	NIC	?	Building CTR responsible.
MR7	Certified Wood	YES	NIC	?	Building CTR responsible.
CATEGORY 5 – INDOOR ENVIRONMENTAL QUALITY					
EQPR1	Minimum IAQ Performance (PREREQUISITE)	NO	NIC	R	Building CTR responsible.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	NO	NO	R	Smoking is prohibited in non-residential federal facilities. Building CTR responsible for building ETS control features. Site CTR responsible for site ETS features.
EQ1	Outdoor Air Delivery Monitoring	YES	NIC	?	Building CTR responsible.
EQ2	Increased Ventilation	YES	NIC	?	Building CTR responsible.
EQ3.1	Construction IAQ Management Plan: During Construction	NO	NIC	1	Building CTR responsible.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	NO	NIC	1	Building CTR responsible.
EQ4.1	Low Emitting Materials: Adhesives & Sealants	NO	NIC	1	Building CTR responsible.
EQ4.2	Low Emitting Materials: Paints & Coatings	NO	NIC	1	Building CTR responsible.
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	NO	NIC	1	Building CTR responsible.
EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	NO	NIC	1	Building CTR responsible.
EQ5	Indoor Chemical & Pollutant Source Control	YES	NIC	?	Building CTR responsible.
EQ6.1	Controllability of Systems: Lighting	YES	NIC	?	Building CTR responsible.
EQ6.2	Controllability of Systems: Thermal Comfort	YES	NIC	?	Building CTR responsible.
EQ7.1	Thermal Comfort: Design	YES	NIC	?	Building CTR responsible.
EQ7.2	Thermal Comfort: Verification	YES	NIC	?	Building CTR responsible.
EQ8.1	Daylight & Views: Daylight 75% of Spaces	YES	NIC	?	Building CTR responsible.

LEED Credit Paragraph	**LEED Multiple Contractor Responsibilities Table**	Building CTR Substitution Permitted	Site CTR Substitution Permitted	**Required Points Strategy**	NIC=Not in Contract N/A=Not Applicable R=Required
BUILDING: TACTICAL EQUIPMENT MAINTENANCE FACILITIES					
PAR	**FEATURE**				**REMARKS**
EQ8.2	Daylight & Views: Views for 90% of Spaces	YES	NIC	?	Building CTR responsible.
CATEGORY 6 – INNOVATION IN DESIGN					
IDc1.1	Innovation in Design	YES	YES	?	Proposed credit must fall within CTR scope or be coordinated with other CTR.
IDc1.2	Innovation in Design	YES	YES	?	Proposed credit must fall within CTR scope or be coordinated with other CTR.
IDc1.3	Innovation in Design	YES	YES	?	Proposed credit must fall within CTR scope or be coordinated with other CTR.
IDc1.4	Innovation in Design	YES	YES	?	Proposed credit must fall within CTR scope or be coordinated with other CTR.
IDc2	LEED Accredited Professional	NO	NO	1	
CATEGORY 7 – REGIONAL PRIORITY CREDITS (v3 only) - 73503					
SSc3	Brownfield Redevelopment	N/A	N/A	0	Not applicable to site.
SSc5.1	Site Development: Protect or Restore Habitat	N/A	N/A	0	Not applicable to site.
SSc6.2	Stormwater Design: Quality Control	NIC	YES	1	Stategy includes stormwater detention pond - Site CTR responsible.
WEc1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	NIC	YES	?	Site will require minimum irrigation - Site CTR responsible.
WEc2	Innovative Wastewater Technologies - OPTION 1 or 2	N/A	N/A	0	No recycled water or wastewater treatment system at this time
EAc2	On-Site Renewable Energy - 1%	YES	NO	?	Building CTR responsible - coordinate with other CTR.
	TOTAL			41	

APPENDIX P

LEED Registration of Army Projects

15 April 2010

Number of Registrations
Each building must be registered separately, except multiple instances of a standard building on a shared site may be registered as a single project. If a single registration for multiple buildings is chosen, all buildings under the single registration must earn exactly the same points. Do not register buildings that are exempt from a specific LEED achievement requirement.

Typical Registration Procedure
1. Login, complete the online registration form (see guidance below) at the GBCI LEED Online website http://www.gbci.org/DisplayPage.aspx?CMSPageID=174 and submit it online.
2. Pay the registration fee via credit card (USACE staff: credit card PR&C is funded by project design or S&A funds).
3. GBCI will follow up with a final invoice, the LEED-online passwords and template information.
4. The individual who registers the project online is, by default, the Project Administrator.

Completing the Registration Form

BEFORE YOU BEGIN:
Create a personal account with USGBC if you do not have one.
You will need the following information:
Project name as it appears in P2 (obtain from USACE Project Manager)
Building number/physical address of project
Zip code for Installation/project location
Anticipated construction start and end dates
Total gross area all non-exempt buildings in registration
Total construction cost all non-exempt buildings only (see Project Details Section instructions below)

ACCOUNT/LOGIN INFORMATION
1. The person registering the project **must have an account with USGBC** (login and password) to complete the form. Go to http://www.gbci.org/ , click on “register a project” at the drop-down menu for project certification (at the top of the page) and select “register now for LEED 2009” to start the project registration process. If you have an account, login with your email address and password and select “register new project” to proceed. If you do not have an account, you may select “register a new account” and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. IMPORTANT: USACE team members are members of USGBC and are eligible for Member prices. USACE team members registering projects should be sure to include the USACE Corporate Access ID in their personal account profile (if you do not have it contact richard.l.schneider@usace.army.mil or judith.f.milton@usace.army.mil for the number).
2. The Account/Login Information section is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

ELIGIBILITY SECTION
Follow directions (accepting the terms and conditions)
Review your profile information and make corrections if needed

RATING SYSTEM SELECTION SECTION
Select single project registration and I know which rating system.
Select the rating system - currently only LEED-NC and LEED for Homes are approved for Army use without special approval.
LEED Minimum Program Requirements: select YES

RATING SYSTEM RESULTS SECTION

Confirm selected rating system.

PROJECT INFORMATION SECTION

Project Title: Begin the project title with a one-word identifier for the Installation. Do not include the word “Fort”. After this match the project name used in P2 (contact the USACE Project Manager for this information) and identify the building being registered. Example: “Stewart 4th IBCT - DFAC”.
Project Address 1 and 2: This is the physical location of the project. Provide building number, street address, block number or whatever is known to best describe the location of the project on the Installation.
Project City: Installation Name
State, Country, Zip Code: Self-explanatory
Anticipated Construction Start and End Dates: Self-explanatory – give your best guess if unknown. Note that required data entry format is: 1 or 2 digit month/1 or 2 digit date/4 digit year (example 3/23/2010)
Gross Square Footage: Provide total area all buildings in LEED project. Exclude the area of any buildings that are exempt from the LEED achievement requirement (for example, exclude an unconditioned storage shed to be constructed with a barracks complex).
Is Project Confidential: Indicate NO except, if project has security sensitivity (elements that are FOUO or higher security), indicate YES.
Notification of Local Chapter: Indicate NO unless Government/USACE Project Manager requests you to indicate YES.
Anticipated Project Type: Select the most appropriate option from the drop-down menu.
Anticipated Certification Level: Select the applicable option from the drop-down menu (Silver is the usual level).

PROJECT OWNER INFORMATION SECTION

Project Owner First Name, Last Name, email, phone, address: The Project Owner is the USACE Project Manager. Obtain this info from the USACE Project Manager.
Organization: U.S. Army Corps of Engineers. This field MUST be completed this way because it will be used as a search field by higher HQ to find all USACE registered projects. You may supplement it with district name at the end but DO NOT revise or use an acronym.
May we publish Owner information: Indicate NO
Owner Type: Pick Federal Government from drop-down menu.
Project Owner Assertion: Check the box

PAYMENT INFORMATION

Self-explanatory

APPENDIX Q
REV 1.1 – 31 MAY 2009
AREA COMPUTATIONS

Computation of Areas: Compute the "gross area" and "net area" of facilities (excluding family housing) in accordance with the following subparagraphs:

(1) Enclosed Spaces: The "gross area" is the sum of all floor spaces with an average clear height ≥6′-11″ (as measured to the underside of the structural system) and having perimeter walls which are ≥4′-11″. The area is calculated by measuring to the exterior dimensions of surfaces and walls.

(2) Half-Scope Spaces: Areas of the following spaces shall count as one-half scope when calculating "gross area":

- Balconies
- Porches
- Covered exterior loading platforms or facilities
- Covered but not enclosed passageways and walks
- Open stairways (both covered and uncovered)
- Covered ramps
- Interior corridors (Unaccompanied Enlisted Personnel Housing Only)

(3) Excluded Spaces: The following spaces shall be excluded from the "gross area" calculation:

- Crawl spaces
- Uncovered exterior loading platforms or facilities
- Exterior insulation applied to existing buildings
- Open courtyards
- Open paved terraces
- Uncovered ramps
- Uncovered stoops
- Utility tunnels and raceways
- Roof overhangs and soffits measuring less than 3′-0″ from the exterior face of the building to the fascia

(4) Net Floor Area: Where required, "net area" is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall "assignable net area" is determined by subtracting the following spaces from the "gross area":

- Basements not suited as office, special mechanical, or storage space
- Elevator shafts and machinery space
- Exterior walls
- Interior partitions
- Mechanical equipment and water supply equipment space
- Permanent corridors and hallways
- Stairs and stair towers
- Janitor closets
- Electrical equipment space
- Electronic/communications equipment space

RMS SUBMITTAL REGISTER INPUT FORM

CONTRACT NUMBER

DELIVERY ORDER

TITLE AND LOCATION

Button <-----Right click for Instructions

SECTION	PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL											CLASSIFICATION						REVIEWING OFFICE					
			01 - PRECON SUBMITTALS	02 - SHOP DRAWINGS	03 - PRODUCT DATA	04 - SAMPLES	05 - DESIGN DATA	06 - TEST REPORTS	07 - CERTIFICATES	08 - MFRS INSTRUCTIONS	09 - MFRS FIELD REPORT	10 - O&M DATA	11 - CLOSEOUT SUBMITTALS	FIO - FOR INFORMATION ONLY	GA - GOVERNMENT APPROVED	DA - DESIGNER OF RECORD APPROVAL	CR - CONFORMANCE REVIEW	DA / CR	DA / GA	DO - DISTRICT OFFICE	AO - AREA OFFICE	RO - RESIDENT OFFICE	PO - PROJECT OFFICE	DR - DESIGNER OF RECORD	AE - ARCHITECT / ENGINEER
00 72 00	52.236-13	Accident Prevention Plan	X														X				X				
00 73 00	1.11	Dev. From Accept. Design. No Deviation from Contract					X											X			X			X	
00 73 00	1.11	Dev. From Accepted Design - Deviates from Contract					X												X		X			X	
00 73 00	1.17	Supplemental Price Breakdown	X											X							X				
00 73 00	1.18	SSHO Qualifications	X												X						X				
01 10 00	5.2.3.1	(if concrete pavement) Joint Layout Plan with design drawings					X										X								
01 10 00	5.5.2	Building Envelope Sealing Performance Testing						X						X							X				
01 10 10	***	Tests as Req by Codes - DOR Develops Test Program						X						X							X			X	
01 10 00	5.8.3	BAS Review Information		X														X		X	X			X	
01 10 00	5.8.3	BAS Performance Verification Test						X						X							X			X	
01 10 00	5.8.4	Testing Adjusting and Balancing						X						X							X			X	
01 10 00	5.8.5	Commissioning						X						X							X			X	
01 10 00	6.15	Environmental As Required for Site Specific					X										X				X			X	
01 10 00	6.16	Permits as required for Site specific					X										X				X			X	
01 10 00	5.10.2	Fire Protection Tests						X	X					X							X			X	
01 32 01.00 10	3.4.1	Preliminary Project Schedule	X												X						X				
01 32 01.00 10	3.4.2	Initial Project Schedule	X												X						X				
01 32 01.00 10	3.4.3	Design Package Schedule	X												X						X				
01 32 01.00 10	3.6.1	Periodic schedule updates from the Contractor	X												X						X				
01 32 01.00 10	3.7	Time Extension Request (Schedule)	X												X						X				
01 33 00	1.8	Submittal Register - DOR Input Required	X												X						X			X	
01 33 00	1.8	Submittal Register Updates (Design Packages, etc.)	X												X						X			X	
01 33 00	1.3.1	Substitution of Manuf or Model Named in Proposal		X	X													X			X			X	
01 33 16	1.2	Identify Designer(s) of Record	X												X						X				
01 33 16	1.1.2 / 3.2.4	Fast Track Design Package(s)					X										X			X	X				
01 33 16	1.2	Identification of all Designers of Record	X														X				X				
01 33 16	3.2.1	Site and Utility Des Package, incl. Substantiation					X										X			X	X				
01 33 16	3.2.2/3.5	Interim Des Subm Package(s), incl. Substantiation					X										X			X	X				
01 33 16	3.5.1	Drawings					X										X			X	X				
01 33 16	3.5.2.2	Sitework Design Analyses					X										X			X	X				
01 33 16	3.5.2.3	Structural Design Analyses					X										X			X	X				
01 33 16	3.5.2.4	Security Design Analyses					X										X			X	X				
01 33 16	3.5.2.5	Architectural Design Analyses					X										X			X	X				
01 33 16	3.5.2.6	Mechanical Design Analyses					X										X			X	X				
01 33 16	3.5.2.7	Life Safety Design Analyses					X										X			X	X				
01 33 16	3.5.2.8	Plumbing Design Analyses					X										X			X	X				
01 33 16	3.5.2.9	Elevator Design Analyses (as Applicable)					X										X			X	X				
01 33 16	3.5.2.10	Electrical Design Analyses					X										X			X	X				
01 33 16	3.5.2.11	Telecommunications Design Analyses					X										X			X	X				
01 33 16	3.5.2.12	Cathodic Protection Design Analyses					X										X			X	X				
01 33 16	3.5.3	Geotechnical Investigations and Reports					X										X			X	X				
01 33 16	3.5.4	LEED Submittals					X										X			X	X				
01 33 16	3.5.5	Energy Conservation Documentation					X										X			X	X				
01 33 16	3.5.6	Specifications					X										X			X	X				
01 33 16	3.5.7	Building Rendering					X										X			X	X				
01 33 16	3.2.4/3.7	Final Des Submittal Package(s), incl. Substantiation					X										X			X	X				
01 33 16	3.7.5	DD Form 1354 (Transfer of Real Property)											X				X				X				
01 33 16	3.2.5/3.8	Design Complete Submittal Package(s)					X										X			X	X				
01 33 16	3.3.3	Design and Code Review Checklists					X										X			X	X				
01 33 16	A-2.0	SID - Interim and Final (as applicable)			X	X	X								X						X				
01 33 16	B-2.0	FFE (as Applicable)					X								X						X				
01 45 04.00 10	3.2	Design and Construction QC Plan	X														X				X				
01 57 20.00.10	1.2	Environmental Protection Plan	X														X				X				
01 78 02.00 10	1.2.1	Final as-Built Drawings											X		X										
01 78 02.00 10	1.2.3.11	Non-Hazardous Solid Waste Diversion Reports							X					X							X				
01 78 02.00 10	1.2.7	Provide final as-built CADD and BIM Model files											X		X						X				
01 78 02.00 10	1.2.9	Provide scans of all other docs in Adobe.pdf format											X		X						X				
01 78 02.00 10	1.3.1	Equip-in-Place list of all installed equip and cost											X		X						X				
01 78 02.00 10	1.3.2	Data on equip not addressed in O&M manuals											X		X						X				
01 78 02.00 10	1.3.3	Final as-built specs - electronic files											X		X						X				
01 78 02.00 10	1.4.2.1	Warranty management plan - FAR 52.246-21											X		X						X				
01 78 02.00 10	1.4.2.1	Certificates of Warranty for extended warranty items											X		X						X				
01 78 02.00 10	1.4.2.1	Contractor's POCs for implementing warranty process											X		X						X				
01 78 02.00 10	1.4.2.1	List of each warranted equip, item, feature or system											X		X						X				
01 78 02.00 10	1.5	See also Section 01 10 00 par. 5.8.4 and 5.8.5											X		X						X				
01 78 02.00 10	1.6.1.2	Equipment O&M Manuals - 1 electronic / 2 hard copies											X		X						X				
01 78 02.00 10	1.7	Field Training DVD Videos										X		X							X				
01 78 02.00 10	1.8	Pricing of CF/CI and GF/CI Property											X	X							X				
01 78 02.00 10	1.11	List of Completed Cleanup Items											X				X				X				

Appendix AA

Interior Signage

Signage.

Signage may be informational, directional, or regulatory. Informational signage provides the user with information and includes room or area labels, bulletin boards, menus, artwork descriptions, and emergency information. Directional signage directs circulation and provides orientation. It includes entry directories, directional arrows, and maps. The purpose of regulatory signage is control: providing prohibitions, warnings, emergency instructions, and use restrictions (Fig. 8.19).

Interior signage is covered in detail in Technical Manual (TM) 5-807-10, Signage. The manual includes graphics for the following: directional, identification signs, information, and pictograms.

I.7.4 Interior Signage.

I.7.4.1 Scope. The standards identified herein are applicable to all interior facilities signage in use on Fort Sill and its sub-installations. Signage for training, special events, exercises, conferences, and other temporary signage is specifically excluded.

I.7.4.2 Policy.

I.7.4.2.1 All requirements for installation of new or replacement of existing deteriorated or missing signs shall be reviewed and approved by the DPW prior to accomplishment.

I.7.4.2.2 All approved facility signs shall be listed in a Building Sign Inventory.

I.7.4.2.3 Unauthorized facility signs shall be removed when found.

I.7.4.2.4 Authorized facility signs which fail to conform to standards but which otherwise are serviceable shall not be replaced solely to conform to standards (AR 420-70).

I.7.4.2.5 Signs for facilities authorized as construction shall be fabricated and installed solely by the DPW. As these type signs become unserviceable, they shall be replaced by the DPW as part of the normal maintenance and repair process.

I.7.4.2.6 All other interior facility signs shall be fabricated and installed as Equipment in Place (EIP). If accomplished by the DPW, fabrication and installation shall be on a cost reimbursable basis. Requestors may, upon approval of the DPW, fabricate and install EIP facility signs. Regardless of the source for fabrication and installation, all interior signs shall conform to standards as identified in this Installation Design Guide. Facility signs provided as EIP shall not be replaced by the DPW as normal maintenance and repair. They shall be removed when they become serviceable and replaced only after receipt, review, and approval of a funded request from the user.

I.7.4.3 Interior sign types authorized as construction are:

I.7.4.3.1 Type BB-4, Room Number Sign. Mandatory for all facilities.

I.7.4.3.2 Type BB-7, Restroom Sign. Mandatory for all facilities with a restroom.

I.7.4.3.3 Type DD-1 or DD-2, Mandatory, Prohibitory Sign. Mandatory for fire extinguisher and fire system locations. This sign is also mandatory for identification of permanent non-smoking areas, such as corridors, public assembly areas, toilets, mechanical areas, stairwells, etc.

I.7.4.3.4 Type AA-5 or AA-6, Directional Signs. These signs may be used to display room numbers only in facilities with complex floor plans.

I.7.4.3.5 Type AA-1, Building Directory. One of these signs is authorized for multi-story buildings or for buildings with complex floor plans.

I.7.4.3.6 Type AA-3, Area or small directory. This sign is optional for multi-story facilities and is limited to areas adjacent to locations of entry to the floor, such as stairwell and elevator doors. Only Sign Grid 2 is authorized.

I.7.4.3.7 Type CC-1, Building Information Sign, Map. This sign is optional for buildings with complex floor plans, is limited to one per floor, and must reflect permanent type facility fixtures, such as areas separated by fire walls, toilets, mechanical rooms, etc.

I.7.4.3.8 Type CC-2, Bulletin Board. This sign is limited to one per facility. If additional CC-2 signs are provided, they shall be provided as Equipment in Place (EIP).

I.7.4.4 Room Schedules. For the purpose of locating the Type BB-4 signs, all projects that involve additional rooms or revisions to the size of existing rooms shall incorporate a room schedule as part of the design package. The room schedule shall incorporate, as a minimum, the following information.

I.7.4.4.1 Room number. The following criteria shall apply to room numbers:

I.7.4.4.1.1 Each individual room shall be assigned a unique room number. The use of a pure numerical designation system is preferred to an alpha-numeric designation system.

I.7.4.4.1.2 Each individual room shall have a single function/purpose. Where there is an open or semi-open area that includes differing purposes, a separate room number shall be identified for each area and some form of structural or architectural demarcation shall be provided between the areas.

I.7.4.4.1.3 Where there is an existing room number system, the room number system utilized in the room schedule shall be an extension of the existing room number schedule. If the work is sufficiently extensive that an extension of the existing room number schedule is impractical, the project scope shall include a complete renumbering of all rooms in the facility and Type BB-4 signs for all rooms.

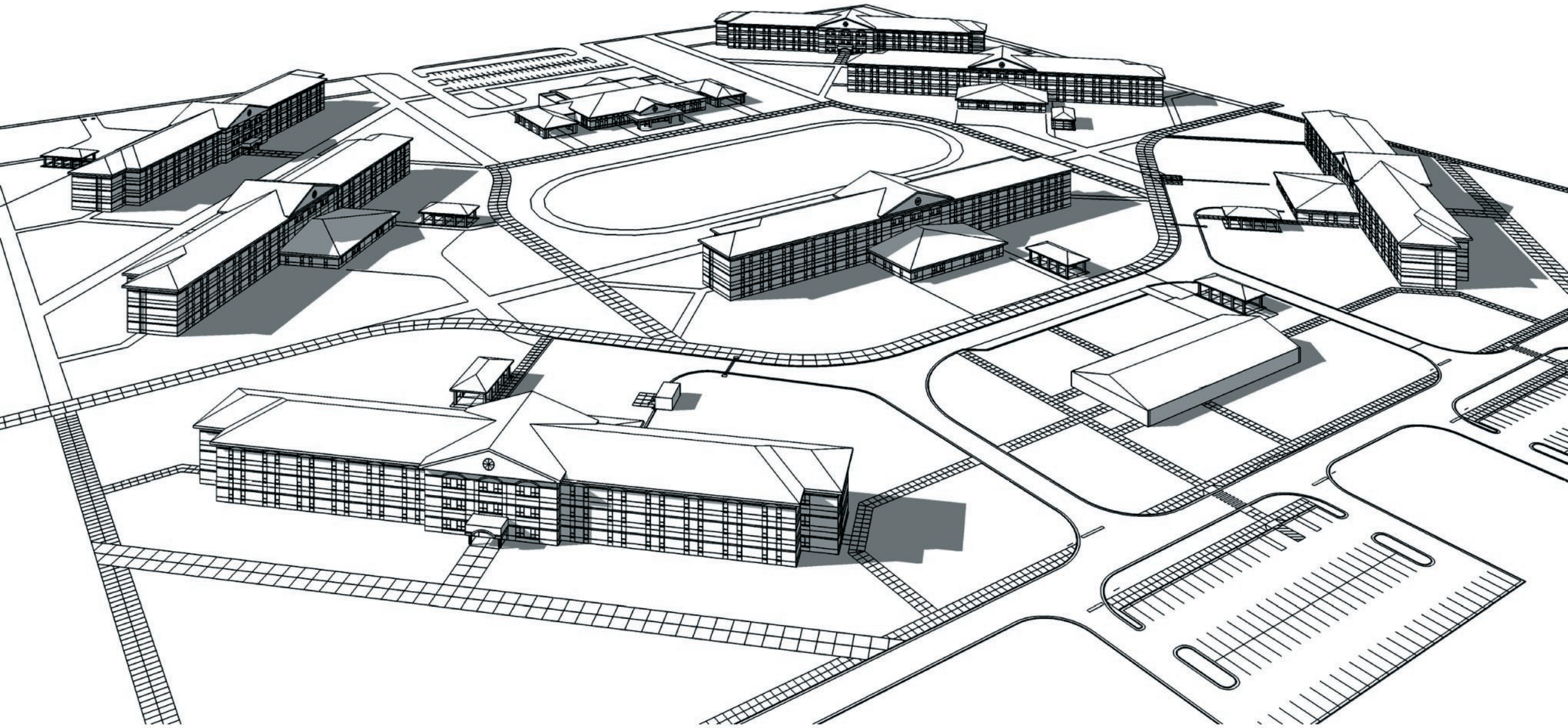
I.7.4.4.2 Net square feet.

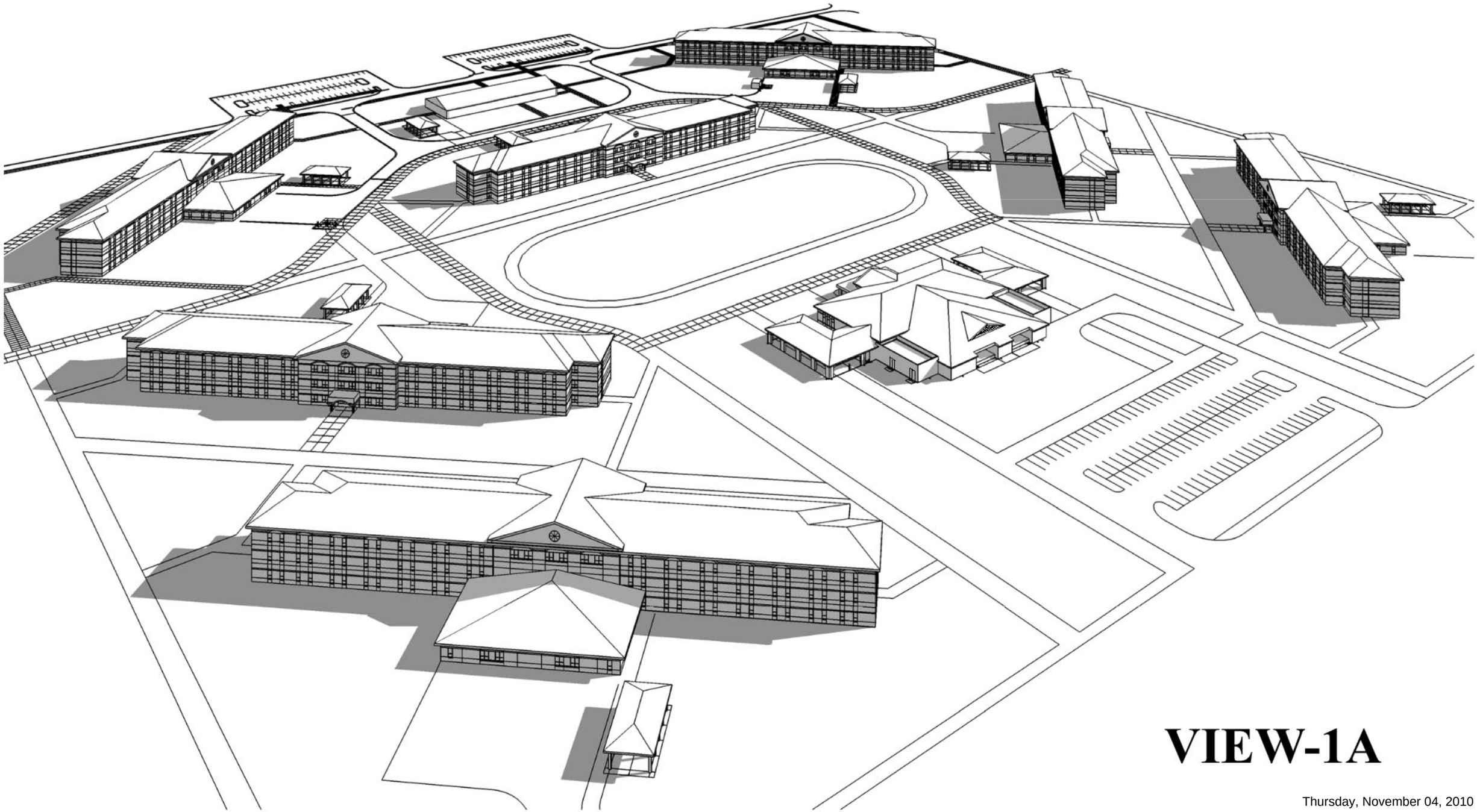
I.7.4.4.3 Room function/purpose.

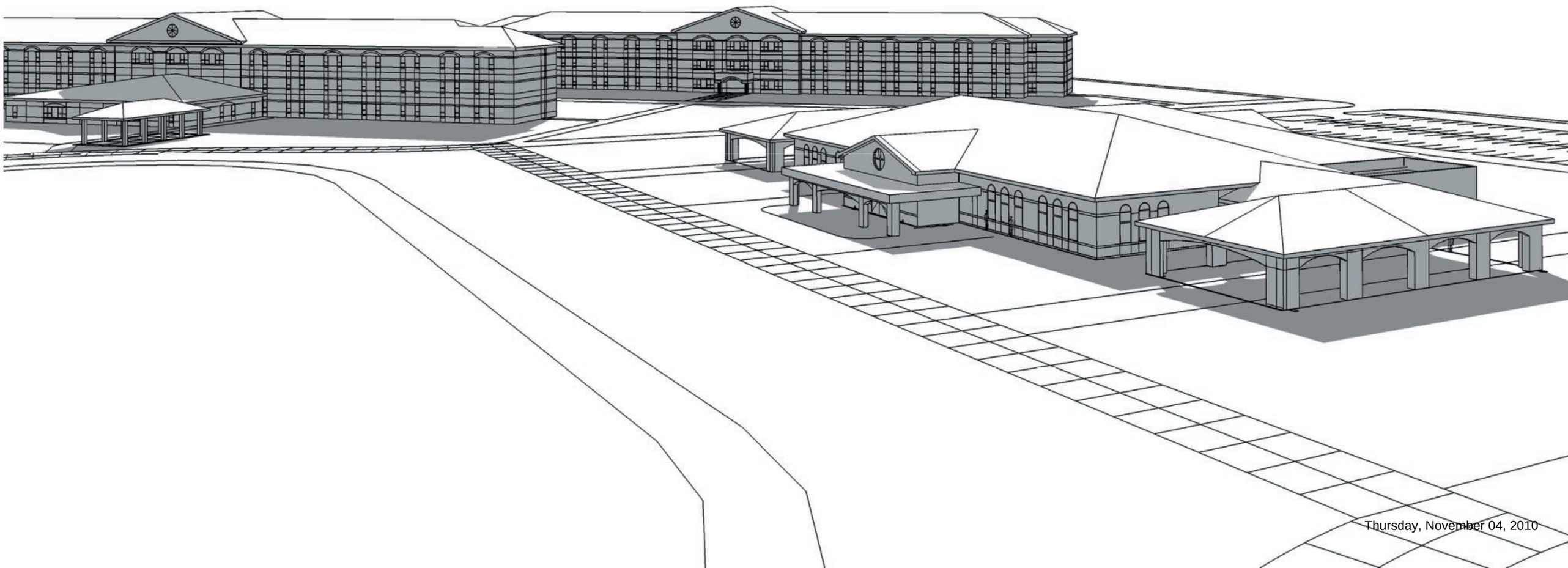
I.7.4.4.4 Ceiling height at wall.

Appendix BB

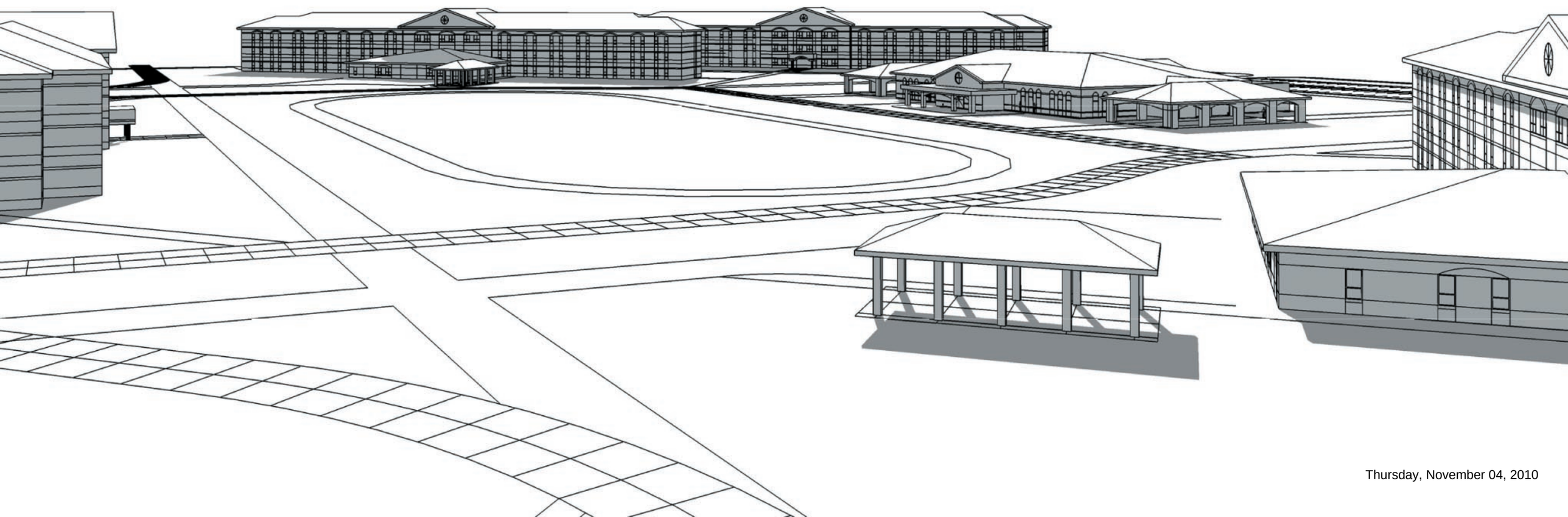
Conceptual Renderings

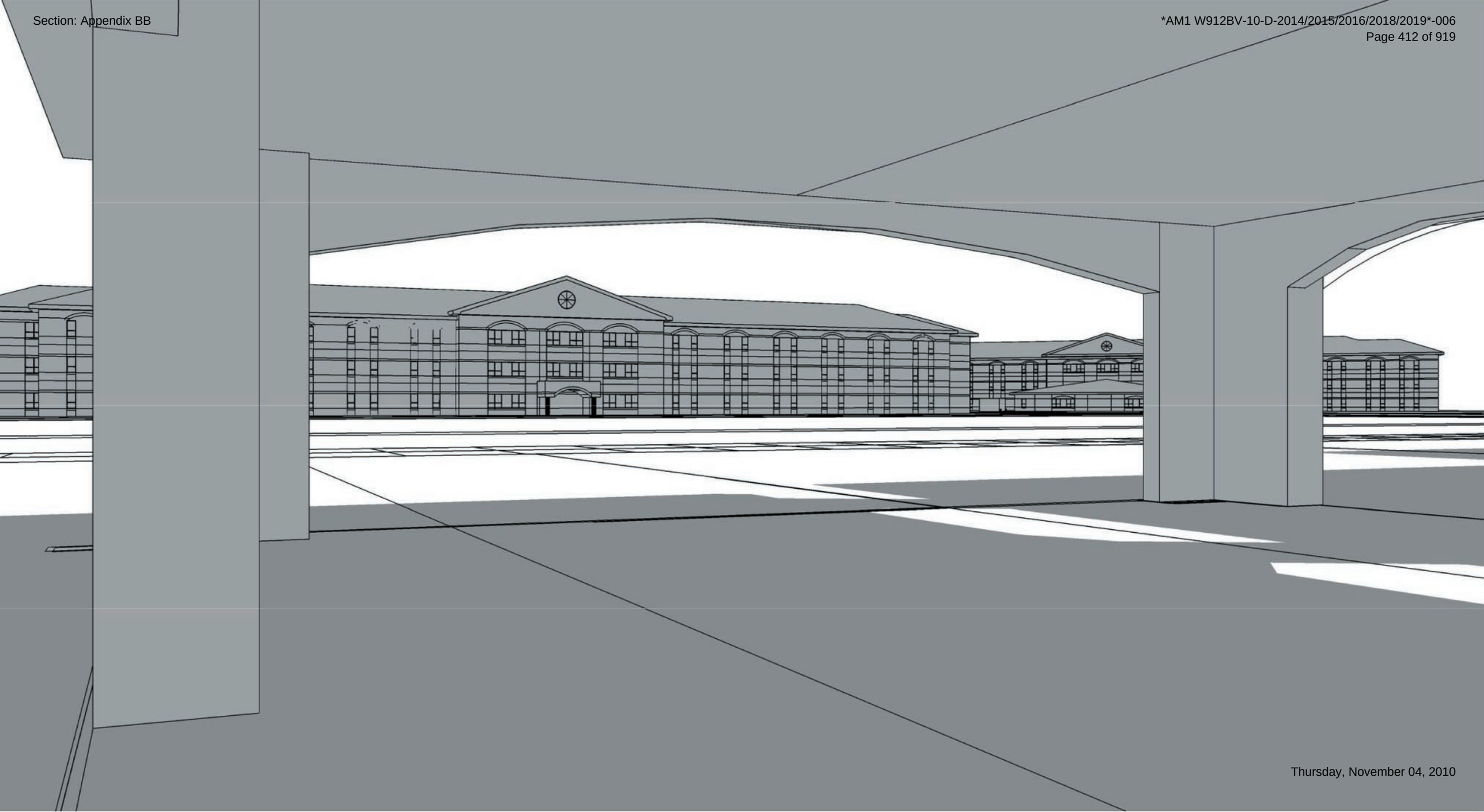


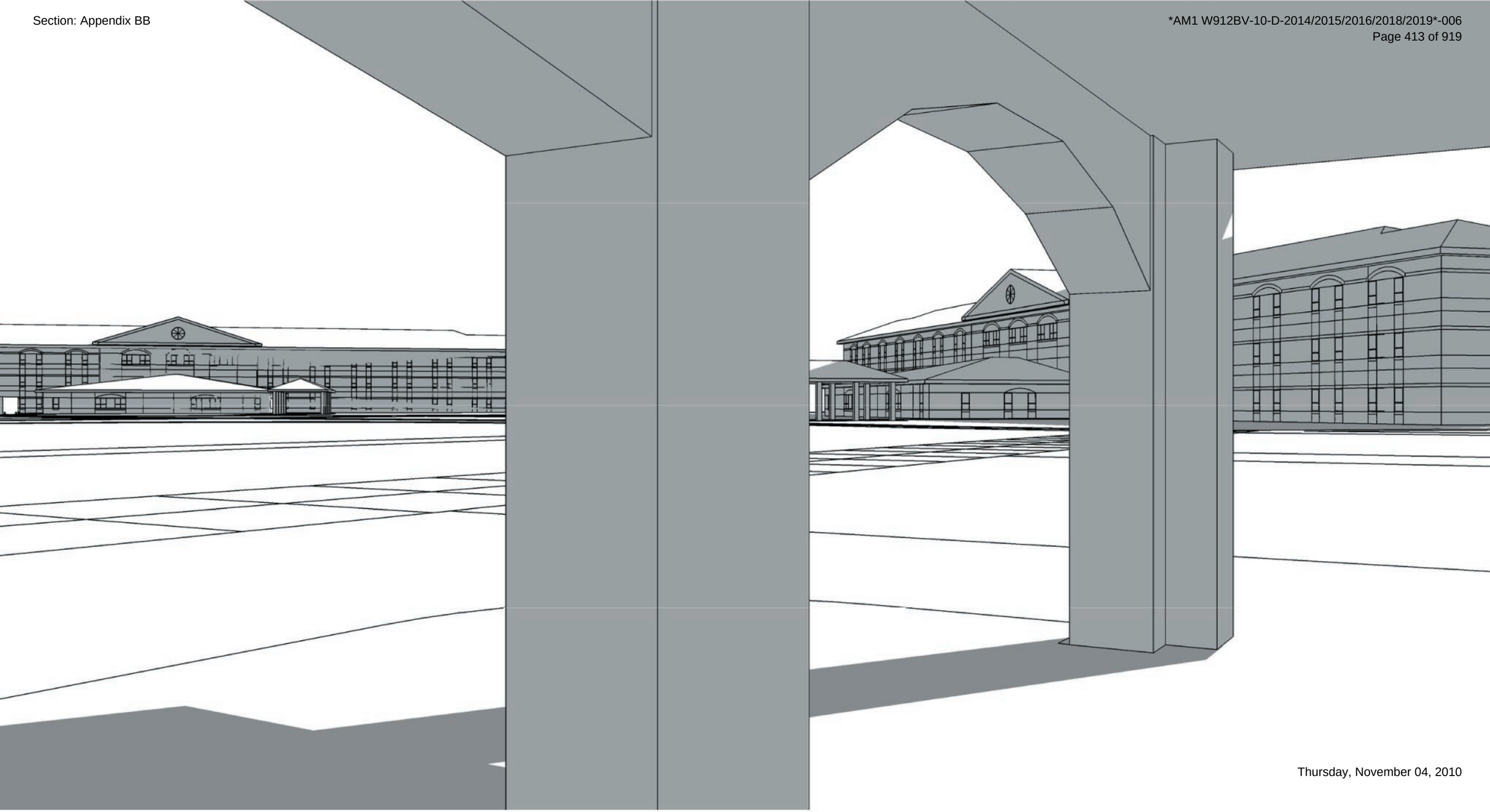

VIEW-1A

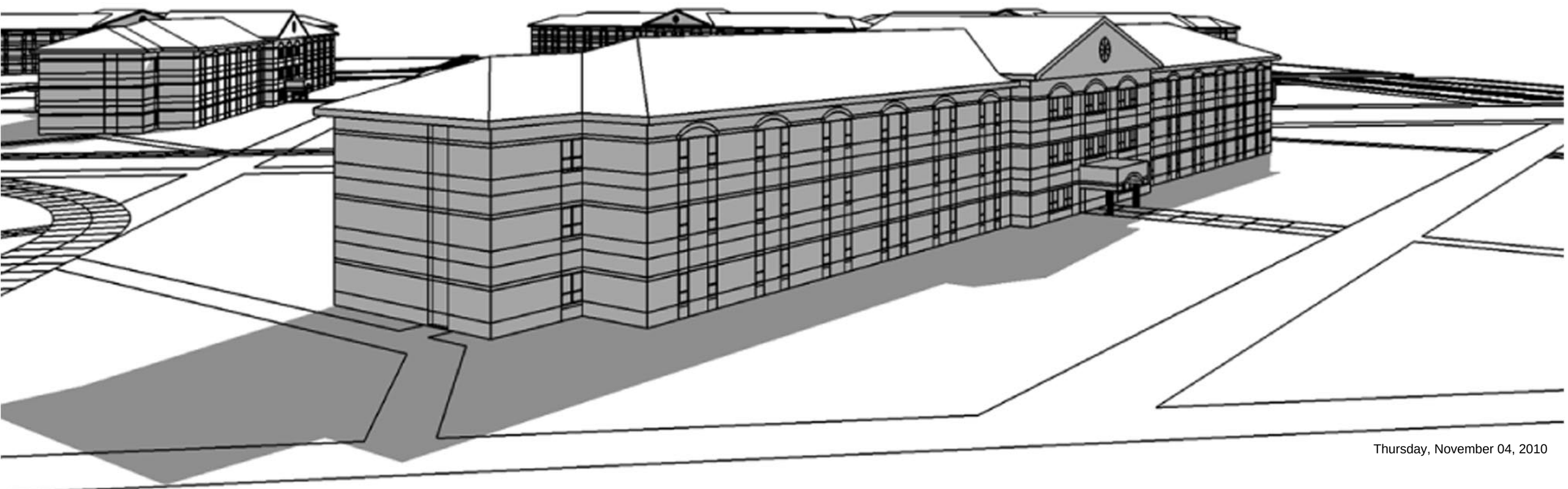


Thursday, November 04, 2010









Thursday, November 04, 2010

Appendix CC

Draft Storm Water Pollution Prevention Plan (SWPPP)

Storm Water Pollution Prevention Plan (SWP3)

for the Construction Activities Associated with the

Advanced Individual Training Complex Project

in

Comanche County, Oklahoma

Prepared for:
XXXXXClientName

Prepared by:
Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

Project Number: 55371

April 2010

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ADDENDUM D - CONTRACTOR CERTIFICATION

(Optional; sample format)

_____

(Name of Owner/Operator)

_____

(Project Name)

Contractors, builders, regular suppliers or others (contractors) involved in construction activity who are not the owner/operator, developer, or general contractor, and have not been issued the Storm Water Construction General Permit (Permit) authorization, execute this Contractor Certification which places the responsibility of complying with and abiding by the intent and purpose of the permit with the contractor for any and all work performed under the authority and direction of the contractor. Furthermore, the contractor assumes responsibility to avoid or eliminate any actual or potential adverse effects upon the environment according to the Storm Water Pollution Prevention Plan (SWP3), during all phases of building, construction, or delivery activity on any and all construction sites under the control and responsibility of the contractor as described in the SWP3.

1. Contractor company name: _____

2. Contractor address: _____

3. Project locations: _____

_____

(For additional addresses, attach list to this form)

4. Contractor must be thoroughly familiar with the original Notice of Intent (NOI) filed by _____

_____ with the Oklahoma Department of Environmental Quality.

(Owner/Operator Name)

Contractor must also be thoroughly familiar with, and adhere to, the Storm Water Pollution Prevention Plan (SWP3) and the Best Management Practices (BMP) on file at the following location; _____

The Contractor is certifying below that they assume all physical responsibility for any and all construction activities performed by the Contractor or under the direction and control of the Contractor, to avoid or eliminate any actual or potential adverse effects upon the environment pertaining to the properties listed in Item 3 above.

Certification

I certify that I understand the terms and conditions of the Oklahoma Pollutant Discharge Elimination System Act (OPDES) General Permit that authorizes storm water discharges associated with construction activity from the construction site identified as part of this certification. I have read and understand the Owner/Operators Notice of Intent and Part 1.3 eligibility requirements for coverage under the general permit for storm water discharges from construction activities, including those requirements published in the modified OPDES General Permit OKR10 of Month Date, 2007, and the SWP3 and BMP described pertaining to the project locations in Item 3 above. I agree that as a contractor, builder, regular supplier, or a support service company, I am responsible for installing and/or maintaining the appropriate pollution prevention measures that I am responsible for according to the agreement I have with the permittee.

I understand that continued coverage under this permit is contingent upon maintaining eligibility as provided for in Part 1.3 of the permit.

Signature: _____ Title: _____

Print Name: _____ Date: _____

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Section 1.0
INTRODUCTION

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) requires a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges from construction projects that disturb more than one acre. For the purposes of the NPDES program, construction activities are defined as clearing, excavating, grading, or other land disturbing activities.

In the State of Oklahoma, the NPDES program has been delegated through the Oklahoma Pollutant Discharge Elimination System Act (OPDES) to the Oklahoma Department of Environmental Quality (DEQ). Construction projects issued a certificate of permit coverage under DEQ General Permit No. OKR10 (Permit) are granted permission to discharge storm water associated with construction activities into state waters. The Permit is issued pursuant to the Clean Water Act as amended (33 U.S.C. 1251 et. seq.) and the provisions of OPDES, 27A O.S. 2-6-201 et seq. A copy of this Permit is located in Appendix A.

Coverage under this Permit is obtained by submitting a Notice of Intent (NOI) at least two weeks prior to initiation of construction activities (a copy of the NOI is located in Appendix B). A Storm Water Pollution Prevention Plan (SWP3) must be developed prior to submittal of the NOI. The SWP3 described herein establishes a plan to manage the quality of storm water runoff from construction activities associated with the Advanced Individual Training Complex Project (Project) located in Comanche County, Oklahoma for the _____. This SWP3 has been developed in accordance with requirements and guidelines specified in Part IV of the Permit.

The SWP3 should be modified as necessary throughout the Project. Best management practices (BMPs) should be moved, added, or redesigned as necessary to control erosion and sedimentation to the maximum extent practicable. The SWP3 was written using the information from the *Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices* (EPA 1993). This document is a guide to be used by the on-site construction personnel to reduce soil erosion and prevent sedimentation and potential on-site pollutants from leaving the site and entering waters of the State of Oklahoma.

1.1 PROJECT LOCATION AND DESCRIPTION

The Project consists of the site planning and design for the Advanced Individual Training (AIT) complex located at Ft. Sill Army Post, Oklahoma.

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The complex includes five new Barracks & Company Operations Facilities (B/COF) buildings, a Battalion Headquarters (BTN HQ) building, an athletic running track, and a dining facility with the ability to allow for the possible future expansion of two more B/COF builidings.

The new facilities consist of two phases of work. Phase I will consist of two new B/COF buildings, a new BTN HQ, new Privately Owned Vehicle (POV) parking lots (on the east side of Blair Street), and a new running track. Phase II will continue with three B/COF buildings a new dining facility, and work on the existing POV parking lot located off Brag Street.

The design work for this project consists of constructing new primary infrastructure utility systems to support the new facility utility requirements, and constructing new POV parking lots, roads, and sidewalks. The work includes the construction of new water distribuation mains, sewer mains, gas distribution mains, and electrical /communication ductbanks. There will be demolition and relocation of portions of the existing utility systems to clear the sites for new facility construction.

The project area is located between Fort Sill Boulevard and McKee Street on the east and west and Thomas Street and Mow-way Road on the north and south.

The Project consists of 159 acres, 93 of which will be disturbed. The Project is scheduled to begin in March 2011 and be completed by June 2012. The general Project location is shown in the General Vincity Map (Figure 1-1).

1.2 PROJECT OWNER AND OPERATOR

The Project owner, XXXX Client Name, will be the responsible entity for completing the Project. Its address and telephone number is:

XXXXX Client Name
XXXXX Street
XXXXX City, XX State XXXXX
Phone: (XXX) XXX-XXXX

The Permittee for the Project, XXXXX, will be responsible for adhering to Permit guidelines. Its address and telephone number are:

XXXXX Company
XXXXX Street

XXXXX City, XX State XXXXX
Phone: (XXX) XXX-XXXX

The signatory authority for the Project is Mr./Ms. Doe, _____position for XXXXX Company. Mr./Ms. Doe can be contacted at (XXX) XXX-XXXX.

The permittee for the Project will have responsibilities for implementing the SWP3, inspecting the Project site as required, maintaining pollution prevention structures and other BMPs, keeping records of inspections and other activities, and the periodic evaluation of the SWP3 provisions on-site.

1.3 CERTIFICATIONS

The permittee shall certify the SWP3 by signing the Owner's Certification form (located in the front of this document) and attaching it to any document, including the SWP3, required by Part VI.G of the Permit. By signing the Contractor Certification form (located near the front of this document, copy as needed), each contractor and subcontractor signifies that it has read, understands, and will adhere to the SWP3 before conducting any construction work that involves soil disturbance. The signed certification confirms that the permittee has notified the contractor or subcontractor that a SWP3 has been prepared for the Project, and that they will perform the necessary actions that have been identified to comply with the SWP3 and the Permit. It may be necessary for the contractor and subcontractor to implement additional erosion control and pollution prevention measures that may not be indicated in this SWP3 to maintain compliance with the Permit.

1.4 STANDARD PERMIT CONDITIONS

This section discusses state and federal penalties for non-compliance with the Permit, as well as standard Permit conditions. The staff responsible for implementation of the SWP3 will be familiar with the requirements of the SWP3 and the Permit.

1.4.1 Duty to Comply with Permit Conditions

The DEQ, as well as the EPA, have substantial penalties for non-compliance with the Permit. The permittee has a duty to comply with all Permit conditions. Failure to comply with any Permit condition is a violation of the Permit and the statutes under which it was issued. It is also grounds for enforcement action including denial of Permit renewal application, fines, imprisonment, termination of coverage under this Permit, or for requiring a discharger to apply for, and obtain, an individual DEQ Permit.

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1.4.2 Final Stabilization and Termination of Coverage

The Project is finally stabilized when all soil disturbing activities at the site have been completed, and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas. For those areas not covered by permanent control measures, an equivalent permanent stabilization measure (such as the use of rip-rap, gabions, or geotextiles) will be employed. Permit coverage is terminated by submitting a Notice of Termination (NOT) to DEQ within 30 days of final stabilization. A copy of the NOT form is included in Appendix C.

1.4.3 Applicability of SWP3 to Contractors

Temporary contractors working on-site shall have procedures in place for spill prevention, response, and cleanup as required. All contractors are required to have Spill Prevention Control and Countermeasure (SPCC) plans in place when fuel and other petroleum products are stored above regulatory threshold amounts on the Project as part of their operation. The permittee will inspect the control measures and either 1) inform contractors of required additions or repairs to be performed by the contractor, or 2) will perform the required corrective action itself if improvements are needed.

1.4.4 Storm Water Pollution Prevention Plan Revisions

The permittee intends to amend this SWP3 periodically to reflect changing site conditions and as regulatory requirements change. In the interim between formal revisions, the Record of Revisions form (Appendix E) is updated as necessary to reflect changing site conditions, and thus represents an unpublished revision to the plan. The Inspection and Maintenance Report Form reflects the BMPs in use as of the date indicated.

The SWP3 will be modified to include release information within 14 calendar days of knowledge of a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302.

1.4.5 Retention of Records

A copy of the SWP3 will be maintained at the appropriate Project construction office(s) from the date of Project initiation to the date of Project completion. Records will be maintained for dates when major grading occurs, construction activities temporarily or permanently cease, stabilization measures are initiated, and final stabilization is achieved. The permittee shall retain copies of the SWP3, all reports required by this permit, and records of all data used to complete the NOI to be covered by this permit for a period of at least three years from the date that the site is finally stabilized. The time period may be extended by request of the Director of the DEQ at any time.

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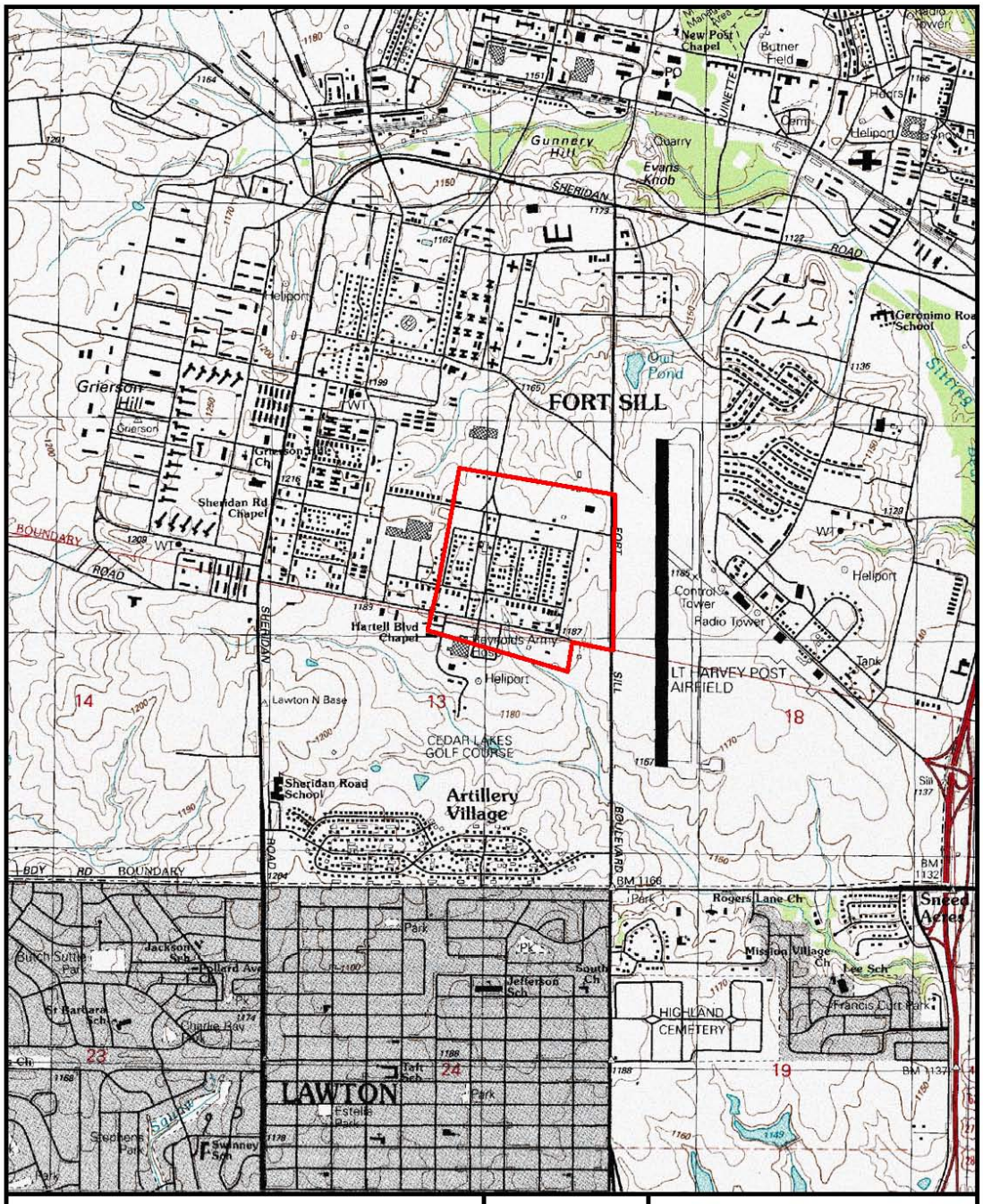

Legend

Project Location

2,000 0 2,000

SCALE IN FEET

NORTH

Source: USGS Topographic Quad: Commanche County; ESRI; Burns & McDonnell Engineering.

Burns & McDonnell SINCE 1898

Figure 1
General Vicinity Map
Advanced Individual Training Complex Project
Comanche County, Oklahoma

Created: March 23, 2010

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Section 2.0
CONSTRUCTION ACTIVITIES AND SITE DESCRIPTION

2.0 CONSTRUCTION ACTIVITIES AND SITE DESCRIPTION

2.1 DESCRIPTION OF CONSTRUCTION ACTIVITIES

A total of 93 acres will be disturbed during construction. Before grading activities begin, all sediment and erosion control measures will be installed. Soil disturbing activities will include grubbing, grading, clearing of vegetation, installation of foundations, buildings, utilities, cleanup and revegetation. All construction activities will disturb as little of the existing vegetation as possible. This SWP3 has been developed and submitted to cover construction activities for all aspects of the Project.

2.2 SEQUENCE OF MAJOR CONSTRUCTION ACTIVITIES

The following is a chronological list of the planned sequence of activities and implementation of temporary and permanent erosion and sediment controls for the construction of the Project:

1. Install erosion and sediment control measures.
2. Grub, clear, strip, and stockpile topsoil as necessary.
3. Conduct grading activities.
4. Install natural gas, domestic water distribution, fire water distribution, sanitary sewer and electrical lines.
5. Construction of AIT buildings
6. Construct of other facilities.
7. Install natural gas, domestic water distribution, fire water distribution, sanitary sewer and electrical lines for other facilities.
8. Install pavement for sidewalks and parking lots.
9. Seed and mulch areas not covered by pavement.
10. Implement final stabilization measures and revegetation.
11. Upon achievement of final stabilization for the whole Project, complete and submit the NOT to DEQ.

2.3 SOILS

Boring tests indicated that soils in the Project area consist of silty sand, clayey sand with gravel, clayey sand, silty clay, sandy clay, clay with sand, fat clay over sandy shale, and shale. These near-surface soils exhibit nonplastic to high plasticity characteristics. Rock material was encountered at depths of 35 to 38 feet.

2.4 POTENTIAL POLLUTANTS

The primary pollutant sources on the construction site will be disturbed soils and subsequent surface water runoff. BMPs will be employed to control erosion and sedimentation, and are discussed in further detail in Section 3.0.

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Other potential pollutant sources include petroleum products needed for the construction equipment, fertilizers, paints, solvents, etc. BMPs for specific product are discussed in Sections 4.0 and 5.0

2.5 SITE MAPS AND DRAWINGS

The General Vicinity Map (Figure 1-1) is located on page 1-6 of this document. Erosion plans and BMP details are located in Appendices E and F, respectively.

2.6 RUNOFF COEFFICIENT

The runoff coefficient "C" is the ratio of the volume of storm water runoff from the site compared to the total volume of precipitation that falls on the site. The Permit requires an estimate of the ratio that represents runoff conditions before construction activities commence, and after the area is stabilized.

The estimate of "C" is based on variables from three general terrain categories:

- Soil properties (porosity, density, etc.)
- Ground slope
- Character of the vegetative cover (woodlands, pasture, grassland, etc.)

Another major variable affecting "C" is rainfall intensity and duration. For any given terrain, the ratio of runoff to rainfall is expected to increase as storm intensity or duration increase. As stated earlier, the site is approximately 159 acres in size; 93 acres will be disturbed. Based on site evaluations and available soils data, the "C" value before construction of the Project is currently estimated to be 0.52. After construction is complete, the "C" value will increase to 0.55.

2.7 CULTURAL RESOURCES

Consultations with the Oklahoma State Historic Preservation Office and the Oklahoma Archaeological Survey will be completed when the Project is awarded.

Should cultural resources be encountered, construction will stop until the area can be evaluated.

2.8 THREATENED AND ENDANGERED SPECIES

Threatened and endangered species consultations will be done with the US Fish and Wildlife Service when the Project is awarded.

2.9 RECEIVING WATERS

Water will sheet flow off-site to the Sitting Bear Creek and an unnamed stream. Sitting Bear Creek is not on the 303(d) list and does not have a Total Maximum Daily Load (TMDL) developed for it. No sensitive waters or watersheds are affected by the Project, nor are any Outstanding Resource Waters.

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Section 3.0
BEST MANAGEMENT PRACTICES

3.0 BEST MANAGEMENT PRACTICES

3.1 EROSION AND SEDIMENT CONTROLS

Soil erosion and sediment controls are measures that are used to reduce the amount of soil particles that are carried from a land area and deposited in receiving waters. This section provides a general description of the most appropriate control measures proposed for the Project. The permittee's construction contractor(s) and their subcontractors will be responsible for amending the erosion and sediment controls in the SWP3 for their portion(s) of the Project. Based on field conditions at the time of construction and remediation, the contractors and subcontractors may adjust the locations and types of BMPs so that erosion and sedimentation are controlled to the maximum extent practicable. However, in no case will modifications to the SWP3 result in any less stringent erosion and sedimentation control measures than specified herein. Any revision to the SWP3 will be recorded on the Record of Revisions form; a copy of the form is located in Appendix E.

Several factors need to be considered when deciding on erosion control techniques. The application of the techniques in the field will be determined by the professional judgment of the permittee's field construction personnel and will depend on site-specific conditions. Factors that may be considered in selection of erosion and sediment controls for site-specific areas may include:

- Size of the area affected
- Type of proposed construction activities
- Soil type and texture
- Amount of rock
- Steepness and length of slope
- Amount of vegetative cover
- Proximity to watercourses or wetlands, particularly downslope from construction activities
- Date and intensity of the last major rain event

Anticipated weather conditions and frozen ground

All applicable soil erosion and sediment control measures will be implemented in accordance with this SWP3 and the Permit prior to commencement of field construction activities. Measures will be maintained during and after the construction activity, until final stabilization of the soil is accomplished. Upon final stabilization of disturbed areas, all temporary soil erosion and sediment control measures will be removed.

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3.2 STRUCTURAL CONTROL PRACTICES

Structural control practices divert flows from exposed soils, storm water flow, or otherwise limit runoff from exposed areas of the site. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection (rip-rap), reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Some of these practices may be used for both temporary and/or permanent control measures. Structural control practices should be placed in upland areas to the degree practicable to prevent erosion and reduce sedimentation in lower elevation areas.

3.2.1 Temporary Erosion and Sediment Control Practices

Erosion and sediment control measures will be in place prior to soil disturbing activities and will be maintained throughout construction. The contractor may need erosion control measures in other locations of the Project as work progresses to keep sediment from leaving the construction site. These measures will be determined by the contractor in the field; if measures are changed, the SWP3 must be modified accordingly. All temporary erosion controls will be removed after the protected area is finally stabilized. In areas where construction has temporarily ceased, temporary stabilization practices must be installed within 14 days. If construction will resume within 21 days of temporary cessation, then temporary stabilization will not have to be installed within 14 days. The minimum temporary erosion and sediment control practices that shall be used for the Project are discussed in the following sections. Details for these controls can be found in Appendices E and F.

3.2.1.1 Construction Access

Construction entrances installed on the Project site will be maintained throughout the duration of construction and soil remediation activities. The amount of sediment that is transported onto a public road surface or other paved areas by construction equipment or vehicles will be minimized. Details can be found in Appendix G.

3.2.1.2 Silt Fence Sediment Barriers

Silt fence will be used to intercept and retain sediment carried by sheet flow from disturbed areas and to prevent sediment runoff from the Project site during excavation. Silt fence will be placed perpendicular to the direction of water flow and as close to the contours as possible with the ends extending upslope. The devices will be placed downslope of disturbed areas where sheet or rill erosion would occur. Once individual areas are stabilized, silt fences can be removed. Installation details for silt fence are located in Appendices F and G.

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3.2.1.3 Inlet Protection

If storm drain inlets at the site have the potential of receiving storm water runoff from the construction site, a temporary sediment control barrier will be placed around the storm drain inlets to prevent sediment from entering storm drains. Assurance of timely inspection and maintenance allows for frequent removal and adequate disposal of accumulated sediment. For more information, refer to the BMP details in Appendices F and G.

3.2.2 Permanent Erosion and Sediment Control Practices

Permanent erosion and sediment control practices are those that will be left in place after construction is finished and the site is stabilized. Unpaved areas will be reseeded or landscaped after the last construction activity has been completed. The time period for soil areas to be without vegetative cover is to be minimized to the extent practical.

3.3 STABILIZATION PRACTICES

Soil stabilization involves covering disturbed soils with grass, mulch, straw, geotextiles, trees, vines or shrubs. Stabilization practices for exposed disturbed soils are extremely important while conducting construction activities. Vegetative cover serves to reduce the erosion potential by absorbing the energy of raindrops, promoting infiltration in lieu of runoff, and reducing the velocity of runoff. Temporary stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased. Areas where soil is exposed will be covered if construction activity will not resume in 14 days. Temporary cover includes, but is not limited to, seeding, mulching, and the placement of gravel. More information on seeding specifications is included in Section 3.5.

3.4 MAINTENANCE AND INSPECTIONS

All erosion and sediment control devices shall be installed pursuant to the specifications in the construction details located in Appendix G. They shall be maintained so that they remain effective at all times.

Erosion and sediment control devices shall be inspected at a minimum of once every 14 days and within 24 hours of each 0.5-inch or greater rainfall event. The frequency of regular inspections should be proportional to the amount of construction activity being conducted. During each inspection, the construction inspector will complete the Inspection and Maintenance Report Form located in Appendix E. These sheets will be copied and used as necessary. Ineffective temporary erosion control measures will be repaired or replaced within seven calendar days of identification. The permittee will immediately install additional temporary erosion control devices in any area deemed in need of protection.

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If inspection results indicate a need to modify the SWP3, the plan will be revised and implemented, as appropriate, within seven calendar days following the inspection. All modifications will be noted on the Record of Revisions form located in Appendix E. The inspection reports will identify any incidents of non-compliance with the Permit.

Following the completion of construction and seeding/planting activities, the construction inspector will conduct periodic site reviews to make sure that vegetation establishment is satisfactory. If vegetative cover is not adequate, special steps to correct problems will be implemented such as overseeding, mulching, sodding, or the use of erosion control blankets.

3.5 FINAL STABILIZATION AND CLEANUP

After final grading is complete, the disturbed areas not containing pavement, rip-rap, cobble, etc. will be permanently stabilized. Soil stabilization involves covering disturbed soils with grass, bark, mulch, straw, geotextiles fabric, trees, vines or shrubs. Vegetative cover serves to reduce the erosion potential by absorbing the energy of raindrops, promoting infiltration in lieu of runoff, and reducing the velocity of runoff. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall also be permanently stabilized to prevent further erosion and sedimentation.

3.5.1 Seeding/Plant Material

The contractor will be responsible for labor, materials, tools, equipment, and other related items required for preparing ground, sowing of seeds, setting plant material, fertilizing, mulching and top dressing. The contractor will also be responsible for other management practices required for erosion control, and for achieving final stabilization. It will be the contractor's responsibility to make sure that the soil seedbed is not blown, washed, or otherwise removed from the site. The contractor will also be responsible for maintaining the areas where plant materials have been installed. The contractor will make repairs (including replacement of lost topsoil and/or mulch) to the seedbed preparation and plant material sites in the event of heavy rain, wind, or other natural events that cause damage. The contractor will follow recommendations which can be found in Appendix G.

3.5.2 Mulching

Mulching will be used in conjunction with both temporary and permanent seeding practices to enhance success by providing erosion protection prior to the onset of vegetative growth. After seeding, mulch will be applied at a rate of two tons per acre on the disturbed areas. Mulch will not be applied in wetlands, on lawns, or areas where hydro-mulch is used. Mulch will be anchored immediately after placement on

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steep slopes and stream banks. Mulch will be mechanically anchored to a depth of two to three inches, or by applying a liquid anchor. Liquid anchors will not be used within 100 feet of wetlands or watercourses. Mulch shall be free from noxious weeds, mold, and other deleterious materials.

Further mulching specifications can be found in Appendix G.

3.5.3 Fertilizer

Soil in areas of disturbance may need supplementation from fertilizer. Soil tests may be necessary to determine the most appropriate fertilizer for each location. Fertilizing will be implemented in accordance with fertilizer specification (Appendix G). Once applied, the fertilizer will be worked into the soil to limit exposure to storm water. Fertilizer spills will be cleaned up immediately and will not be applied along or within a waterway.

3.5.4 Removal of Temporary Controls

Temporary erosion controls will be left in place until the Project site is stabilized with a uniform vegetative cover of 70 percent density of the native background vegetative cover. Following revegetation, the permittee will conduct periodic site visits to make sure that vegetation establishment is satisfactory. If sufficient vegetative cover has not been achieved, additional restoration measures will be implemented. Inspection results will be documented using the Inspection and Maintenance Report Form found in Appendix E.

All temporary soil erosion and sediment control measures will be removed and disposed of after final site stabilization is achieved and before submitting the NOT.

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Section 4.0
GOOD HOUSEKEEPING

4.0 GOOD HOUSEKEEPING

4.1 MATERIAL HANDLING

All construction materials that pose a potential contamination threat to storm water (e.g., petroleum products, solvents) will be managed to minimize exposure to storm water. Materials will be kept in secure containers and be properly labeled. Copies of the Material Safety Data Sheets (MSDS) will be maintained on-site.

4.2 SOLID AND LIQUID WASTE DISPOSAL

Solid and liquid waste (including sediment, asphalt, concrete millings, floating debris, paper, plastic, fabric, and construction and demolition debris) will be disposed of properly and in accordance with all applicable disposal requirements. All waste material will be collected and stored in a secure container or removed from the Project site. The waste containers will be inspected regularly. No solid or liquid wastes will be disposed of on-site (e.g. buried, poured), but will be taken off-site for proper disposal.

4.3 HAZARDOUS WASTE

Any hazardous waste material will be disposed in the manner specified by the manufacturer and by local, state, and federal regulations. Site personnel must be made aware of this requirement. Spill response procedures are located in Section 5.0.

4.4 SANITARY WASTE

Contractors and subcontractors must comply with all federal, state, and local sanitary sewer, portable toilet or septic system regulations. Each contractor or subcontractor shall provide sanitary facilities at the Project site throughout construction activities. The sanitary facilities should be used by all construction personnel and be serviced regularly.

4.5 NON-STORM WATER DISCHARGES

The following non-storm water discharges from active construction sites are authorized if discharge is in compliance with Part 1.3.1.C. of the Permit:

- Fire hydrant flushings
- Waters used to wash vehicles where detergents are not used
- Water used to control dust in accordance with Part 4.5.2.C.2
- Potable water, including waterline flushing and initial pressure testing of newly constructed piping where the piping is clean and chemical agents have not been added to the test water or applied to the pipes
- Routine external building wash down which does not use detergents
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used

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- Uncontaminated air conditioning or compressor condensate
- Uncontaminated ground water or spring water
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Landscape irrigation
- Discharge or flows from emergency fire fighting activities
- Uncontaminated flows from excavation dewatering activities will be allowed if operational and structural controls are used to reduce any pollutant releases in order to avoid or minimize the impacts on water quality; these structural controls must be included in the SWP3

4.6 WATER SOURCE

Water used to establish and maintain grass, to control dust, and for other construction purposes must originate from a public water supply or private well approved by the State of Oklahoma or local health department. Any potable water must follow local and state regulations for water standards.

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Section 5.0
SPILL PREVENTION AND CONTROL PLAN

5.0 SPILL PREVENTION AND CONTROL PLAN

This section comprises the Spill Prevention and Control Plan (SPCP), which describes measures to prevent, control, and minimize impacts from a spill of a hazardous, toxic, or petroleum substance during construction of the proposed Project. This plan describes the transport, storage, and disposal procedures for potentially hazardous materials, and outlines the procedures to be followed in the event of a spill of a contaminating or toxic substance.

As per 40 CFR 112, a Spill Prevention Control and Countermeasures Plan (SPCC) must be prepared if the construction site will have 1,320 gallons of above ground storage capacity (or 42,000 gallons in underground storage not regulated by UST rules) or more in 55-gallon sized (or larger) containers. This would include any temporary tanks or fueling trucks used to "store" petroleum on-site. The truck would be subject to the SPCC Plan rules when parked on the construction site and used for "storage".

If, at any time, a subcontractor's cumulative capacity exceeds 1,320 gallons, the subcontractor shall maintain a certified SPCC Plan in accordance with 40 CFR 112.

5.1 MATERIAL MANAGEMENT PRACTICES

Properly managing materials on the construction site will greatly reduce the potential for storm water mixing with hazardous materials. Good housekeeping, along with proper use and storage of construction materials, form the basis for proper management of potentially hazardous materials.

5.1.1 Good Housekeeping

The proper use of materials and equipment along with the use of general common sense greatly reduce the potential for contaminating storm water runoff. The following is a list of good housekeeping practices to be used during the Project:

- Hazardous materials, chemicals, fuels, and oils shall not be stored within 100 feet of any stream bank, wetland, water supply well, spring, or other waterbody
- Fueling of construction equipment shall not be conducted within 100 feet of any stream bank, wetland, water supply well, spring, or other waterbody
- Every effort will be made to store the minimum amount of hazardous materials on-site
- Materials stored on-site will be stored in a neat, orderly manner in appropriate containers and, if possible, under a roof or other enclosure
- Products will be kept in original containers with the original manufacturer's label
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of the product will be used before disposing of the container
- Manufacturer's recommendations for proper use and disposal of a product will be followed
- If surplus product must be disposed of, manufacturer's or local and state recommended methods for proper disposal will be followed

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5.1.2 Non-Petroleum Products

Due to the chemical makeup of specific products, certain handling and storage procedures are required to promote the safety of handlers and prevent the possibility of pollution. Care shall be taken to follow all directions and warnings for products used on the site. All pertinent information can be found on the Material Safety Data Sheets (MSDS) for each product. The MSDS will be kept on-site.

5.1.3 Petroleum Products

On-site vehicles will be monitored for leaks and receive regular maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Preferably, the containers will be stored in a covered truck or trailer that provides secondary containment for the products.

Bulk storage tanks having a capacity of greater than 55 gallons will be provided with secondary containment. Containment can be provided by a temporary earthen berm or other means. After each rainfall event, the contractor shall inspect the contents of the secondary containment area for excess water. If no sheen is visible, the collected water can be pumped to the ground in a manner that does not cause scouring. If any sheen is present, it must be treated prior to discharging the water. Otherwise, the contaminated water must be transported and disposed off-site in accordance with local, state and federal requirements.

Bulk fuel or lubricating oil dispensers shall not have a self-locking mechanism that allows for un-supervised fueling. Fueling operations shall be observed to immediately detect and contain spills.

No waste oil or other petroleum-based products will be disposed of on-site (e.g. buried, poured, etc.), but shall be taken off-site for proper disposal.

5.2 SPILL CONTROL AND CLEANUP

In addition to the material management practices discussed previously, the following spill control and cleanup practices will be adhered to prevent storm water pollution in the event of a spill:

1. Personnel on-site will be made aware of cleanup procedures and the location of spill cleanup equipment.
2. Spills will be contained and cleaned up immediately after discovery.
3. Manufacturer methods for spill cleanup of a material will be followed as described on the material’s MSDS.
4. Materials and equipment needed for cleanup procedures will be kept readily available on the site, either at an equipment storage area or on contractor's trucks; equipment to be kept on the site will include but not be limited to brooms, dust pans, shovels, granular absorbents, sand, saw dust, absorbent pads and booms, plastic and metal trash containers, gloves, and goggles.
5. Toxic, hazardous or petroleum product spills required to be reported by regulation will be documented to the appropriate federal, state, and local agencies.
6. Spills will be documented and a record of the spills will be kept with this SWP3.

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The federal reportable spill quantity for petroleum products is defined in 40 CFR 110 as any oil spill that:

1. Violates applicable water quality standards.
2. Causes a film or sheen upon or discoloration of the water surface or adjoining shoreline.
3. Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

The Federal reportable spill quantities for hazardous materials are listed in 40 CFR, Part 302.4 in the table entitled "List of Hazardous Substances and Reportable Quantities." A procedure for determining a reportable spill is included in Appendix H, along with a copy of the Spill Report Form to be completed as the result of a reportable spill. If a Spill Report Form is not available at the time of the spill, the information required for the Spill Report Form in Appendix H will be recorded by the contractor and provided to the owner.

In the State of Oklahoma, a reportable spill of hazardous waste is defined the same as in the federal regulations. A reportable spill of oil is the quantity which causes a "film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines."

If a spill is reportable, the contractor's superintendent will, within 15 minutes of discovering the spill, contact the contractor's project manager, Mr./Ms. Doe at (XXX) XXX-XXXX, and the following authorities:

Federal:	National Response Center – 800.424.8802 or 202.267.2675
State:	Oklahoma DEQ, Environmental Complaints Program – 800.522.0206

If a reportable release occurs, a modification to the SWP3 must be made within 14 days. The modification shall include:

1. Date of the release.
2. Description of the release.
3. Explanation of why the spill happened.
4. Description of procedures to prevent future spills and/or releases from happening.
5. Description of response procedures if a second spill or release occurs with 14 days of the first release.

A written description of the release must be submitted to the permitting authority that includes:

1. Description of the release, including the date of the release, the type of material and the estimated amount of spill.
2. Explanation of why the spill happened.
3. Description of the steps taken to prevent and control future releases.

These modifications to the SWP3 shall be documented on the Record of Revisions form in Appendix E.

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APPENDICES

APPENDIX A
General Permit

GENERAL PERMIT
OKR10

FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES WITHIN THE STATE OF OKLAHOMA

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER QUALITY DIVISION

September 13, 2007

Storm Water General Permit for Construction Activities

Permit No. OKR10

Authorization to Discharge Under the Oklahoma Pollutant Discharge Elimination System Act (OPDES)

In compliance with the provisions under the OPDES, 27A O.S. 2-6-201 et seq., as amended, except as provided in Part 1.3.2 of this permit, owners/operators of storm water discharges from construction activities, located in an area specified in Part 1.2, are authorized to discharge in accordance with the conditions and requirements set forth herein. Only those owners/operators of storm water discharges from construction activities in the general permit area who submit a Notice of Intent (NOI) and receive an authorization to discharge in accordance with Part 2 of this permit are authorized under this general permit.

This permit is a reissuance by the Department of Environmental Quality (DEQ) and shall become effective on September 13, 2007. This permit replaces the permit issued on September 13, 2002. This permit and the authorization shall expire at midnight, September 12, 2012.

Signed:

__/Jon L Craig/____
Jon L. Craig, Director
Water Quality Division

_____/Mark Derichsweiler/_____
Mark Derichsweiler, P.E, Engineering Manager
Water Quality Division

GENERAL PERMIT OKR10 FOR STORM WATER DISCHARGES

FROM CONSTRUCTION ACTIVITIES WITHIN THE STATE OF OKLAHOMA

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OPDES General Permit for Storm Water Discharges From Construction Activities

Part 1. Coverage Under This Permit

1.1 Introduction

Under the authority of the Oklahoma Pollutant Discharge Elimination System Act (OPDES), the Oklahoma Department of Environmental Quality (DEQ) is issuing the general permit OKR10, which authorizes discharges of storm water associated with construction activity. This is a reissuance of the general permit for large and small construction activities and replaces the current permit issued on September 13, 2002.

1.2 Permit Area

Under EPA's approval of the OPDES program, the DEQ has had storm water permitting and enforcement responsibility for large and small construction activities since November 19, 1996, except for construction activities associated with oil & gas extraction and agricultural activity, or those construction activities located on Indian Country Lands[1].

Table 1-1 Areas of Coverage Where the EPA is the Permitting Authority Within the State of Oklahoma

Any Construction Activity on Indian Country Lands[1] in Oklahoma
Construction activity associated with Oil and gas extraction under SIC Group 13 (Note: The DEQ does have authority over the natural gas liquid extraction plants identified under SIC code 1321, and service company base operating stations identified under SIC 1389); Pipelines under SIC Group 46, except pipelines within certain facilities regulated by the DEQ; Natural gas transmission under SIC Group 492, except that the DEQ has jurisdiction over natural gas liquid extraction plants
Construction activities associated with Agricultural production and services under SIC Groups 01, 02 and 07; Forestry under SIC Group 08; Fishing, hunting and trapping under SIC Group 09, except the DEQ shall have jurisdiction over industry group number 092 (fish hatcheries and preserves).

If you desire an authorization to discharge storm water from a construction activity listed in Table 1-1 above, you must apply to the EPA at the following addresses:

For an electronic Notice of Intent (eNOI): http://cfpub1.epa.gov/npdes/stormwater/enoi.cfm

Or

For a paper Notice of Intent (NOI): Storm Water Notice of Intent (4203M)

[1] Under EPA's 1996 approval of the State of Oklahoma's permitting program, the State was not authorized to issue NPDES permits under the federal Clean Water Act in areas of Indian country, as defined in 18 U.S.C. § 1151, within the State. 61 Fed. Reg. 65047, 65049 (December 10, 1996). Therefore, this permit does not apply to discharges of storm water in Indian country. However, section 10211(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act of 2005 ("SAFETEA"), Public Law 109-59, 119 Stat. 1144 (August 10, 2005), provides the State the opportunity to request approval from EPA to administer federal environmental regulatory programs, including the Clean Water Act NPDES program, in Indian country areas of the State. The submission, by the State, and review, by EPA, of this permit is without prejudice to the State's right to request such approval at any time.

US EPA
1200 Pennsylvania Avenue, NW
Washington, DC 20460

1.3 Eligibility

1.3.1 Authorized Discharges

A. Permittees are authorized to discharge pollutants in storm water runoff associated with construction activities as defined in 40 CFR 122.26 (b)(14)(x) for construction sites of five or more acres, and 40 CFR 122.26 (b)(15)(i) for construction sites of more than one acre but less than five acres**,** including the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb land equal to or greater than one acre, and those construction site discharges designated by the Director as needing a storm water permit under 40 CFR 122.26 (a)(1)(v), or under 122.26 (a)(9) and 122.26 (g)(1)(i). Discharges identified under Part 1.3.2 are excluded from coverage. Any discharge authorized by a different OPDES permit may be commingled with discharges authorized by this permit.

B. This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas) provided:

1. The support activity is directly related to a construction site that is required to have OPDES permit coverage for discharges of storm water associated with construction activity;
2. The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and
3. Appropriate controls and measures are identified in a Storm Water Pollution Prevention Plan (SWP3) covering the discharges from the support activity areas.
4. The support activity is not located within the watershed of an Outstanding Resource Water (see Part 9 Definition and Addendum F Outstanding Resource Waters)

C. The following allowable non- stormwater discharges are authorized by this permit:

1. Fire hydrant flushings;
2. Waters used to wash vehicles where detergents are not used;
3. Water used to control dust in accordance with Part 4.5.2.C.2;
4. Potable water, including waterline flushing and initial pressure tests of newly constructed piping where the piping is clean and chemical agents have not been added to the test water or applied to the pipes;
5. Routine external building wash down which does not use detergents;
6. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
7. Uncontaminated air conditioning or compressor condensate;
8. Uncontaminated ground water or spring water;
9. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
10. Landscape irrigation;

11. Discharge or flows from emergency fire fighting activities;
12. Uncontaminated flows from excavation dewatering activities will be allowed if operational and structural controls are used to reduce any pollutant releases in order to avoid or minimize the impacts on water quality. These controls must be included in your SWP3.

1.3.2 Limitations on Coverage

A. *Post Construction Discharges*: This permit does not authorize storm water discharges that originate from the site after construction activities have been completed and the site, including any temporary support activity site, has undergone final stabilization. Industrial post-construction storm water discharges may need to be covered by a separate OPDES permit.

B. *Discharges Mixed With Non-Storm Water*: This permit does not authorize discharges that are mixed with sources of non-storm water, other than those discharges that are identified in Part 1.3.1.C (Exceptions to prohibition on non-storm water discharges) and are in compliance with Part 4.5.9. (non-storm water discharges).

C. *Discharges Covered by Another Permit*: This permit does not authorize storm water discharges associated with construction activity that have been covered under an individual permit or which require coverage under an alternative general permit in accordance with Part 6.12.

D. *Discharges Threatening Water Quality*: This permit does not authorize storm water discharges from construction sites that the Director determines will cause, or have reasonable potential to cause or contribute to violations of water quality standards, including anti-degradation policy. Where such determinations have been made, the Director may notify the operator(s) that an individual permit application is necessary in accordance with Part 6.12. However, the Director may authorize coverage under this permit after appropriate controls and implementation procedures designed to bring the discharges into compliance with water quality standards have been included in the SWP3.

E. *Discharges Not Protective of Listed Endangered Species*: This permit does not authorize storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities that are not protective of Federal and State listed endangered and threatened species or designated critical habitat. See Part 11 for more information.

1. For the purposes of complying with Part 1.3. eligibility requirements, storm water discharge-related activities include:

   a. Activities that cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to excavation, site development, grading, and other land disturbing activities; and

   b. Measures to control storm water including the siting, construction, and operation of best management practices (BMPs) to control, reduce, or prevent storm water pollution.

2. Coverage under this permit is available only if the applicant certifies that it meets at least one of the criteria in paragraphs a, b, c, d, or e below. Failure to continue to meet one of these criteria during the term of the permit will render an applicant ineligible for coverage under this permit.

a. The proposed construction site or land disturbing activity is not located within any of the corridors of the Federal or State identified sensitive waters or watersheds, and further investigation is not required.

b. The proposed construction site or land disturbing activity is located within a corridor of a Federal or State identified sensitive water or watershed (Addendum A). The SWP3 describes this area in relation to the identified water or watershed and specifies the measures to be employed to protect the endangered or threatened species or their critical habitat.

c. If applicant's storm water discharges and storm water discharge-related activities meet the criteria under Part 1.3.2.E.2.a, b, d, or e, there is no need to contact the U.S. Fish and Wildlife Service (USFWS) for Federal sensitive waters and watersheds, or the Oklahoma Department of Wildlife Conservation (ODWC) for State sensitive waters (see Part 11). If one of those eligibility criteria cannot be met, applicants may contact those agencies to evaluate the effects on listed species and critical habitat of the applicant's storm water discharges and storm water discharge-related activities, resulting in either a no jeopardy or a written concurrence by the agency on a finding that the applicant's storm water discharges and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat; or

d The applicant's construction activities are authorized by the appropriate Federal or State agency and that authorization addresses the incidental taking of listed species by the applicant's storm water discharge or storm water discharge-related activities; or

e The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part 1.3.2.E.2.a, b, c, or d. that included the applicant's project area. By certifying eligibility under Part 1.3.2.E.2.e, the applicant agrees to comply with applicable measures or controls upon which the other operator's certification under Part 1.3.2.E.2.a, b, c. or d. was based.

3. The applicant must comply with any applicable terms, conditions, or other requirements developed in the process of meeting the eligibility requirements of Part 1.3.2.E.2.a, b, c, d, or e. above to remain eligible for coverage under this permit. Such terms and conditions must be incorporated in the applicant's SWP3.

4. Applicants who choose to meet the eligibility requirements of Part 1.3.2.E.2.c. must submit a copy of the wildlife agency's report of findings to the DEQ Storm Water Section.

5. This permit does not authorize any storm water discharges where the discharges or storm water discharge-related activities cause a prohibited "take" (as defined in Part 9) of endangered or threatened species.

6. This permit does not authorize any storm water discharges where the discharges or storm water discharge-related activities are likely to jeopardize the continued existence of any species that are listed or proposed to be listed as endangered or threatened or result in the adverse modification or destruction of habitat that is designated or proposed to be designated as critical.

F. *Construction on Indian Country Land*: This permit does not authorize storm water discharges that originate from construction activities on Indian Country Lands. Such discharges are regulated by the EPA Region 6 offices located in Dallas, Texas.

G. *Construction Activities for Oil and Gas Operations and Pipelines*: The Energy Policy Act of 2005 amends the Clean Water Act with regard to oil and gas exploration, production, processing, and treatment activities. The June 12, 2006 final rule exempts the oil and gas industry, including associated construction activities, from NPDES storm water permits. Therefore, Facilities that are currently regulated under the DEQ's permit, such as Natural Gas Liquid Extraction Plants (NAICS 211112, CIS 1321) and Oil and Gas Field Services for Company Base Operating Stations (NAICS 213112, SIC 1389), are not required to obtain permit coverage. However, Facilities that have a discharge of a reportable quantity release or that contribute pollutants (other than non-contaminated sediment) to a violation of a water quality standard are required to obtain and maintain OPDES permit coverage for storm water for the entire operating life of the facility. The Director may authorize coverage under this permit for any construction activities within those facilities after appropriate controls and implementation procedures designed to bring the discharge into compliance with water quality standards unless and/or until termination requirements are met.

H. *Construction Activities Related to Agriculture*: This permit does not authorize storm water discharges that originate from construction activities related to Agriculture, that are under the jurisdiction of the Oklahoma Department of Agriculture, Food, and Forestry. Such discharges are regulated by the EPA Region 6 offices located in Dallas, Texas.

I. New sources or new discharges of constituents of concern to impaired waters are not authorized by this permit unless otherwise allowable under OAC 252:606 and applicable state law. Impaired waters are those that do not meet applicable water quality standards and are listed on the Clean Water Act Section 303(d) list. Pollutants of concern are those constituents for which the water body is listed as impaired. Oklahoma State 303(d) water body lists can be obtained from the Integrated Water Quality Assessment Report on the DEQ web site at http://www.deq.state.ok.us/WQDnew/305b_303d/index.html, or the DEQ GIS Map and Data Viewer at http://maps.scigis.com/deq_wq/.

Discharges of pollutants of concern to impaired water bodies for which there is an approved total maximum daily load (TMDL) or a watershed plan incorporated in Oklahoma's Water Quality Management Plan in lieu of a TMDL are not eligible for coverage under this permit unless they are consistent with the approved TMDL or watershed plan. Approved TMDL reports or watershed plans can be downloaded from the DEQ website at http://www.deq.state.ok.us/WQDnew/tmdl/index.html. Permittees must incorporate any limitations, conditions, or requirements applicable to their discharges necessary for compliance with the TMDL or watershed plan, including any monitoring or reporting required by the TMDL or watershed plan, into their SWP3 within the time specified in the TMDL or watershed plan in order to be eligible for coverage under this general permit

1.4 Obtaining Authorization

1.4.1. In order for storm water discharges from construction activities to be authorized under this general permit, an owner/operator must:

A. Meet the Part 1.2. eligibility requirements;

B. Except as provided in Part 2.1.4, develop a Storm Water Pollution Prevention Plan (SWP3) covering either the entire site or all portions of the site where they are operators (see definition in Part 9) according to the requirements in Part 4.1 A "joint" SWP3 may be

developed and implemented as a cooperative effort where there is more than one operator at a site; and

C. Submit a Notice of Intent (NOI) in accordance with the requirements of Part 2, using an NOI form provided by the Director in Addendum B (or a photocopy thereof) and also available at http://www.deq.state.ok.us/WQDnew/stormwater/index.html. Only one NOI need be submitted to cover all of the owner/operator's activities on a common plan of development or sale (e.g., you do not need to submit a separate NOI for each separate lot in a residential subdivision or for two separate buildings being constructed at a manufacturing facility, provided the SWP3 covers each area for which you are an operator). The SWP3 must be implemented upon commencement of construction activities.

D. Develop and implement a storm water pollution prevention plan (SWP3) according to the requirements in Part 4 of this permit. You are required to submit a copy of your complete SWP3 to the DEQ for review if your discharges meet the special conditions listed in Part 2.5 of the permit. If your discharges do not meet the special conditions listed in Part 2.5 of the permit, you are not required to submit a copy of the SWP3 when you submit your NOI.

E. Pay the applicable annual permit fee established in OAC 252:606 Appendix D. If not included with the NOI, a statement of the fee due will be sent to the applicant. The fee must be received before the authorization will be issued.

F. Receive an authorization from the DEQ.

1.4.2. Any new operator on site, including those who replace an operator who has previously obtained permit coverage, must submit an NOI to obtain permit coverage.

1.4.3. Once authorization is issued by the DEQ, dischargers who submit an NOI in accordance with the requirements of this permit are authorized to discharge storm water from construction activities under the terms and conditions of this permit. The DEQ may deny coverage under this permit and require submittal of an application for an individual OPDES permit based on a review of the NOI or other information (see Part 6.12 of this permit).

1.5. Terminating Coverage

1.5.1. Permittees wishing to terminate coverage under this permit must submit a Notice of Termination (NOT) in accordance with Part 8 of this permit., using an NOT form provided by the Director and found in Addendum C of the permit (or a photocopy thereof), and available at http://www.deq.state.ok.us/WQDnew/stormwater/index.html. Compliance with this permit is required until an NOT is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT is signed.

1.5.2. All permittees must submit an NOT within thirty (30) days after one or more of the following conditions have been met:

A. Final stabilization (see definition Part 9) has been achieved on all portions of the site for which the permittee is responsible (including, if applicable, returning agricultural land to its pre-construction agricultural use);

B. For residential construction only: temporary stabilization has been completed and the residence has been transferred to the homeowner;

C. When another owner/operator has assumed control according to Part 6.7.3. over all areas of the site that have not been finally stabilized. The NOT must be submitted with the new owner/operator's NOI;

1.5.3. The DEQ will review NOTs for completeness and accuracy and inspect the site for which the NOT was submitted within 30 days of receipt of the NOT. Permittees can submit an Inspection Request Form (see Addendum E of the permit) to the DEQ for an inspection prior to submitting an NOT. The DEQ will schedule an inspection and provide any assistance necessary within 30 days of receipt of the written request. Upon completing the inspection, the DEQ will notify the permittee of any needed changes to the site conditions, or that the site has met the termination requirements under this permit. Only one Inspection Request Form can be submitted to the DEQ within a ninety (90) day period. Additional compliance inspections may occur within this 90 day period at the discretion of the DEQ. Enforcement actions may be taken if a permittee submits an NOT without meeting one or more of the conditions in Part 1.5.2.

Part 2. Notice of Intent Requirements

2.1. Deadlines for Notification

2.1.1. Parties defined as owners/operators (see definition in Part 9) due to their operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications and/or owners/operators with day-to-day operational control over construction activities at a project, which are necessary to ensure compliance with a storm water pollution prevention plan or other permit conditions must receive authorization from the DEQ (after submitting an NOI in accordance with the requirements) prior to the commencement of construction activities (i.e., the initial disturbance of soils associated with clearing, grading, excavation activities, or other construction activities).

2.1.2. For storm water discharges from construction projects where the operator changes, including, instances where an operator is added after an NOI has been submitted under Part 2.1.1, the new operator must submit an NOI at least two (2) days before assuming operational control over site specifications or commencing work on-site.

2.1.3. Owners/operators are not prohibited from submitting late NOIs. When a late NOI is submitted, authorization is only for discharges that occur after permit coverage is granted. The Department reserves the right to take appropriate enforcement for any unpermitted activities that may have occurred between the time construction commenced and authorization of future discharges is granted.

2.1.4. Owners/operators of on-going construction projects as of the effective date of this permit that received authorization for storm water discharges under the DEQ General Permit OKR10 For Storm Water Discharges From Construction Activities Within the State of Oklahoma, issued September 13, 2002, must:

A. Submit an NOI within 90 days of the effective date of this permit. If the permittee is eligible to submit an NOT (e.g., construction is finished and final stabilization has been achieved) before the 90th day, a new NOI is not required to be submitted. Owners/Operators must remain in compliance with existing requirements of General Permit OKR10, issued September 13, 2002, until a new authorization is received or an NOT is submitted.

B. Update the SWP3 to comply with the requirements of Part 4 within 90 days after the effective date of this permit.

2.1.5. Owners/operators of on-going construction projects as of the effective date of this permit that did not receive authorization to discharge under the DEQ General Permit OKR10 issued September 13, 2002, who wish to discharge under this permit, must submit an NOI and obtain

authorization under this permit. A SWP3 must be developed to comply with the requirements of Part 4.

2.2. Contents of Notice of Intent (NOI)

Use of Revised NOI Form. The NOI form shall include the following information:

2.2.1. Indication of whether you are modifying your NOI;

2.2.2. The name, address, E-mail address, and telephone number of the owner/operator filing the NOI for permit coverage;

2.2.3. Indication of whether you are a Federal, State, Tribal, private, or other public entity;

2.2.4. The name (or other identifier), address, county, and latitude/longitude of the construction project or site;

2.2.5. Indication of whether the project or site is located on Indian Country lands. Note: Construction projects requiring permit coverage that are located on federally recognized Indian Country lands in Oklahoma are permitted by the U.S. EPA Region 6 Office located in Dallas, Texas (see Part 1.2 of the permit);

2.2.6. Confirmation that an SWP3 has been developed, and that the SWP3 will be compliant with any applicable local sediment and erosion control plans. Do not submit a copy of your SWP3 unless required by Part 2.5;

2.2.7. Availability of your SWP3 for viewing, the location where the SWP3 may be viewed, and the name and telephone number of a contact person for scheduling viewing times;

2.2.8. The name of the receiving water(s);

2.2.10. Indication of whether your receiving water is included on the DEQ's 303(d) list of impaired waters;

2.2.11. Indication of whether your discharge will be consistent with the conditions and requirements of EPA approved or established TMDLs or watershed plans;

2.2.12. Estimates of project start and completion dates, and estimates of the number of acres of the site on which soil will be disturbed;

2.2.13. Based on the instructions in Part 11 and Addendum A, determination of whether the proposed construction site or land disturbing activity is within the specified corridor of a Federal or State sensitive water or watershed

2.2.14. The applicant shall certify permit eligibility, in Endangered Species areas, by selecting a, b, c, d, or e of Part 1.3.2.E.2.

2.3. Where To Submit

NOIs must be signed in accordance with Part 6.7., and sent to the following address: Department of Environmental Quality, Environmental Complaints and Local Services, Storm Water Unit, P.O. Box 1677, Oklahoma City, OK 73101-1677, or Fax to (405) 702-6223.

2.4. Modification of an NOI

After issuance of an authorization, an amended NOI may be submitted by a permittee if circumstances change (e.g. the area to be disturbed has changed from 5 acres to 7 acres). The amended NOI shall include the facility's assigned permit number and request a change. The original authorization number will be retained. The DEQ will provide an acknowledgement by mail or e-mail

that the amended NOI has been received. Permittees must update their SWP3s to reflect the modification.

2.5. SWP3 Submittal

You must submit a copy of your SWP3 along with your signed NOI if any of these conditions apply:

2.5.1. Any area of your construction site is located within the watershed of an Outstanding Resource Water (see definition in Part 9 and Addendum F Outstanding Resource Waters);

2.5.2. Any area of your construction site is located within a sensitive water and watershed identified in Addendum A;

2.5.3. The area to be disturbed on your construction site is forty (40) acres or more.

Part 3. Special Conditions, Management Practices, and Other Non-Numeric Limitations

3.1.Prohibition on Non-Storm Water Discharges

3.1.1. Except as provided in Parts 1.3.1.B or 1.3.2 and 3.1.2 or 3.1.3, all discharges covered by this permit shall be composed entirely of storm water associated with construction activity;

3.1.2. Discharges of material other than storm water that are in compliance with an OPDES permit (other than this permit) issued for that discharge may be discharged or mixed with discharges authorized by this permit.

3.1.3. The non-storm water discharges listed in Part 1.3.1.C. of the permit are authorized by this permit provided the non-storm water component of the discharge is in compliance with Part 4.5.9 (non-storm water discharges).

3.2.Releases in Excess of Reportable Quantities

The discharge of hazardous substances or oil in the storm water discharge(s) from a facility shall be prevented or minimized in accordance with the applicable SWP3 for the facility. This permit does not relieve the permittee of the reporting requirements of 40 CFR 110, 40 CFR 117 and 40 CFR 302.

Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117 or 40 CFR 302, occurs during a 24 hour period:

3.2.1. *Reporting a Reportable Spill:* The permittee is required to notify the National Response Center (NRC) (800-424-8802 in Washington, DC) in accordance with the requirements of 40 CFR 110, 40 CFR 117 and 40 CFR 302, and the DEQ Hotline (800-522-0206 statewide) as soon as the discharge is discovered.

3.2.2. *Storm Water Pollution Prevention Plan Requirements*: The SWP3 required under Part 4 of this permit must be modified within 14 calendar days of knowledge of the release to provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

3.3.Spills

This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

3.4. Discharge Compliance with Water Quality Standards

Operators seeking coverage under this permit shall not be causing or have the reasonable potential to cause or contribute to a violation of a water quality standard. Where a discharge is already authorized under this permit and is later determined to cause or have the reasonable potential to cause or contribute to the violation of an applicable water quality standard, the Director will notify the operator of such violation(s). The permittee shall take all necessary actions to ensure future discharges do not cause or contribute to the violation of a water quality standard and document these actions in the SWP3. If violations remain or re-occur, then coverage under this permit may be terminated by the Director, and an alternative general permit or individual permit may be issued. Compliance with this requirement does not preclude any enforcement activity as provided by the Clean Water Act (CWA) for the underlying violation. If such violation is determined, the Director may require you to:

3.4.1. Develop a supplemental BMP action plan describing SWP3 modifications in accordance with Part 4.4 to address adequately the identified water quality concerns;

3.4.2. Submit valid and verifiable date and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or

3.4.3. Cease discharges of pollutants from construction activity and submit an alternative general permit or individual permit application.

3.5. Responsibilities of Owner/Operators

Permittees may meet one or both of the operational control components in the definition of "owner/operator" found in Part 9. Either Parts 3.5.1 or 3.5.2 or both will apply depending on the type of operational control exerted by an individual permittee.

3.5.1. If you have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications (e.g., developer, owner, or operator), you must ensure that:

A. The project specifications meet the minimum requirements of Part 4 (Storm Water Pollution Prevention Plans), and all other applicable permit conditions;

B. The SWP3 indicates the areas of the project where you have operational control over project specifications (including the ability to make modifications in specifications), and ensure all other permittees implementing portions of the SWP3 who may be impacted by any changes to the plan are notified of such modifications in a timely manner; and

C. The SWP3 for portions of the project where you are the operator indicates the name and DEQ permit number for parties with day-to-day operational control of those activities necessary to ensure compliance with the SWP3 or other permit conditions. If these parties have not been identified at the time the SWP3 is initially developed, the permittee with operational control over project specifications shall be considered to be the responsible party until such time as the authority is transferred to another party (e.g., general contractor) and the plan updated.

3.5.2. If you have operational control over day-to-day activities, you must ensure that:

A. The SWP3 for portions of the project where you are the operator meets the minimum requirements of Part 4 (SWP3) and identifies the parties responsible for implementation of control measures identified in the plan.

B. The SWP3 indicates areas of the project where you have operational control over day-to-day activities.

C. The SWP3 for portions of the project where you are the operator indicates the name and OPDES permit number of the party(ies) with operational control over project specifications (including the ability to make modifications in specifications).

3.5.3. If you have operational control over a portion of a larger construction project (e.g., a utility contractor or one of four homebuilders in a subdivision), you are responsible for compliance with all applicable terms and conditions of this permit as it relates to your activities on your portion of the construction site, including protection of endangered species, implementation of BMPs, and other controls required by the SWP3. You must ensure either directly or through coordination with other permittees, that your activities do not render another party's pollution controls ineffective. You must either implement your portions of a common SWP3 or develop and implement your own SWP3.

3.5.4 If you have operational control over utility installation (e.g., telephone, electric, gas, cable TV, etc.), your activities must be covered under an SWP3, either a "joint SWP3" for the larger common plan of development or sale, or your own SWP3. You are responsible for maintenance of the SWP3 on the areas disturbed by your activities. You must ensure the protection of endangered species, implementation of BMPs, and final stabilization requirements. This applies to utility companies and their subcontractors. If you are a contractor and not meeting the definition of "owner/operator" (see Part 3.5.1, 2 and 3), you are not required to submit an NOI for the permit coverage. You may be covered by a "contractor certification" or similar arrangement (see Addendum D of the permit).

Part 4. Storm Water Pollution Prevention Plans (SWP3)

4.1 Storm Water Pollution Prevention Plan (SWP3)

4.1.1. An SWP3 must be prepared prior to submission of an NOI as required in Part 2 of the permit. At least one SWP3 must be developed for each construction project or site covered by this permit. For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWP3 is encouraged. Individual operators at a site may, but are not required to, develop separate SWP3s that cover only their portion of the project provided reference is made to other operators at the site. In instances where there is more than one SWP3 for a site, coordination must be conducted between the permittees to ensure the storm water discharge controls and other measures are consistent with one another (e.g., provisions to protect listed species and critical habitat).

4.1.2. SWP3s shall be prepared in accordance with good engineering practices. The SWP3 shall identify potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges from the construction site. The SWP3 shall describe and ensure the implementation of practices that will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and assure compliance with the terms and conditions of this permit.

4.1.3. When developing SWP3s, applicants must follow the procedures in Part 11 of this permit to determine whether listed endangered or threatened species or critical habitat would be affected by the applicant's storm water discharges or storm water discharge-related activities. Any information on whether listed species or critical habitats are found in proximity to the construction site must be included in the SWP3. Any terms or conditions that are imposed

under the eligibility requirements of Part 1.3.2.E. and Part 11 of this permit to protect listed species or critical habitat from storm water discharges or storm water discharge-related activity must be incorporated into the SWP3. Permittees must implement the applicable provisions of the SWP3 required under this part as a condition of this permit.

4.1.4. If your construction site discharges into a receiving water which has been listed on the Clean Water Act 303(d) list of impaired waters, and your discharges contain the pollutant(s) for which the waterbody is impaired, you must document in your SWP3 how the BMPs and other controls selected for your site will control the discharge of the pollutant(s) of concern.

If a TMDL or watershed plan has been approved for the waterbody, you must also describe how your SWP3 is consistent with any TMDL or watershed plan requirements applicable to your discharge. If a TMDL has not yet been approved and the proposed discharge meets the eligibility requirements of Part 1.3, you must describe how the BMPs and other controls selected for your SWP3 will reduce the discharge of the pollutant(s) of concern.

A list of 303(d) listed streams can be obtained from the Integrated Water Quality Assessment Report on the DEQ webpage at. http://www.deq.state.ok.us/WQDnew/305b_303d/index.html, or the DEQ GIS Map and Data Viewer at http://maps.scigis.com/deq_wq/.

An approved TMDL report or watershed plan can be downloaded from the DEQ website at http://www.deq.state.ok.us/WQDnew/tmdl/index.html.

4.2 Deadlines for Plan Preparation and Compliance

The SWP3 shall:

4.2.1. Be completed prior to commencing construction to be covered under this permit (except as provided in Parts 2.1.4) and updated as appropriate.

4.2.2. Provide for compliance with the terms and schedule of the SWP3 beginning with the initiation of construction activities.

4.3. Signature, Plan Review and Making Plans Available

4.3.1 The SWP3 shall be signed in accordance with Part 6.7, and be retained on-site at the facility that generates the storm water discharge in accordance with Part 5 (Retention of Records) of this permit.

4.3.2. The permittee shall post a notice near the main entrance of the construction site with the following information:

A. The OPDES permit number for the project or a copy of the NOI if a permit number has not yet been assigned;

B. The name and telephone number of a local contact person;

C. A brief description of the project; and

D. The location of the SWP3 if the site is inactive or does not have an on-site location to store the plan.

If posting this information near a main entrance is infeasible due to safety concerns, the notice shall be posted in a local public building. If the construction project is a linear construction project (e.g., pipeline, highway, etc.), the notice must be placed in a publicly accessible location near where construction is actively underway and moved as necessary. This permit

does not provide the public with any right to trespass on a construction site for any reason, including inspection of a site; nor does this permit require that permittees allow members of the public access to a construction site.

4.3.3. The permittee shall make SWP3s available upon request to**:** the Director of the DEQ and/or any State, Federal, or local agency approving sediment and erosion plans, grading plans, or storm water management plans; the U.S. Fish and Wildlife Service or the Oklahoma Department of Wildlife Conservation; local government officials; or the operator of a municipal separate storm sewer receiving discharges from the site. The copy of the SWP3 that is required to be kept on-site or locally available must be made available to the Director for review at the time of an on-site inspection. Also, in the interest of public involvement, the DEQ encourages permittees to make their SWP3s available to the public for viewing during normal business hours.

4.3.4. The Director may notify the permittee at any time that the SWP3 does not meet one or more of the minimum requirements of this Part. Such notification shall identify those provisions of this permit that are not being met by the SWP3 as well as those requiring modification in order to meet the minimum requirements of this Part. Within seven (7) calendar days of receipt of such notification from the Director (or as otherwise provided by the Director), the permittee shall make the required changes to the SWP3 and shall submit to the Director a written certification that the requested changes have been made. The Director may take appropriate enforcement action for the period of time the permittee was operating under a plan that did not meet the minimum requirements of this permit.

4.4 Keeping Plans Current

The permittee must amend the SWP3 whenever:

4.4.1. There is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to the waters of the State that has not been addressed in the SWP3; or

4.4.2. Inspections or investigations by site operators, local, State or Federal officials indicate the SWP3 is proving ineffective in eliminating or significantly minimizing pollutants from sources identified under Part 4.5.1.B of this permit, or is otherwise not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity.

4.5 Contents of Plan

The SWP3 shall include the following items:

4.5.1. Site and Activity Description

Each SWP3 shall provide a description of potential pollutant sources and other information as indicated below:

A. A description of the nature of the construction activity (e.g., low density residential, shopping mall, highway, etc.);

B. A description of the intended sequence of major activities that disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities, and infrastructure installation);

C. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities including off-site borrow and fill areas;

D. An estimate of the runoff coefficient of the site for both the pre-construction and post-construction conditions and data describing the soil or the quality of any discharge from the site;

E. A general location map (e.g., USGS quadrangle map, or a portion of a city or county map) with enough detail to identify the location of your construction site and the receiving waters within one mile of the site;

F. A legible site map, showing the entire site, indicating the following: drainage patterns and approximate slopes anticipated after major grading activities; areas of soil disturbance; areas that will not be disturbed; locations of major structural and nonstructural controls identified in the SWP3; locations where stabilization practices are expected to occur; locations of off-site material, waste, borrow, or equipment storage areas; location of all surface waters (including wetlands); locations where storm water discharges to a surface water; and areas where final stabilization has been accomplished and no further construction-phase permit requirements apply;

G. Location and description of any discharge associated with industrial activity other than construction at the site, including storm water discharges from dedicated asphalt plants and dedicated concrete plants, that are covered by this permit;

H. The name of the receiving water(s) and the areal extent and description of wetlands or other special aquatic sites (as defined by 40 CFR 230.3(q-1)) at or near the site that will be disturbed or that will receive discharges from disturbed areas of the project;

4.5.2 A copy of the permit requirements

A copy of this permit and of the signed NOI that was submitted to the DEQ must be included in your SWP3.

4.5.3 Documentation of measures to protect endangered or threatened species

The SWP3 must include information on whether listed endangered or threatened species or critical habitat are found in proximity to the construction activity, and whether such species may be affected by the applicant's storm water discharges or storm water discharge-related activities. You must describe and implement the measures necessary to protect these endangered species and threatened habitat in the SWP3, including any conditions included in correspondence between the USFWS, ODWC or others (see Part 11).

4.5.4 Documentation of Federal, State or local historic preservation laws

The SWP3 must include information on whether storm water discharges or storm water discharge-related activities would have an affect on a property that is protected by Federal, State, or local historic preservation laws along with any written agreements reached with the State services (see Part 10) to mitigate those effects.

4.5.5 Documentation of Water Quality-Impaired Waters

The SWP3 must include information on whether storm water discharges or storm water discharge-related activities would have an affect on water quality impaired receiving waters. The permittee must describe how the BMPs and other controls selected for the site will reduce and avoid the discharges of pollutants of concern into any 303(d) impaired waters. The permittee must describe and implement any measures necessary to meet the requirements of an approved TMDL or watershed plan and/or associated implementation schedule established

in the TMDL or watershed plan. Monitoring and reporting of discharge quality may also be required if necessary to ensure compliance with an approved TMDL or watershed plan.

4.5.6 Controls to Reduce Pollutants

Each SWP3 shall include a description of appropriate control measures (i.e., BMPs) that will be implemented as part of the construction activity to control pollutants in storm water discharges. The SWP3 must clearly describe for each major activity identified in Part 4.5.1: appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and which permittee is responsible for implementation (e.g., perimeter controls for one portion of the site will be installed by Contractor A after the clearing and grubbing necessary for installation of the pollution prevention measure, but before the clearing and grubbing for the remaining portions of the site; and perimeter controls will be actively maintained by Contractor B until final stabilization of those portions of the site up-gradient of the perimeter control; and temporary perimeter controls will be removed by the permittee after final stabilization). The description and implementation of control measures shall address the following minimum components.

A. Erosion and Sediment Controls.

1. *Short and Long Term Goals and Criteria*:

   a. The construction-phase erosion and sediment controls should be designed to retain sediment on site to the extent practicable.

   b. All control measures must be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the permittee must replace or modify the control for site situations.

   c. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize offsite impact (e.g., fugitive sediment in street could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

   d. Sediment must be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

   e. Litter, construction debris, and construction chemicals exposed to storm water shall be prevented from becoming a pollutant source for storm water discharges (e.g. screening outfalls or picked up daily).

   f. Offsite material storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the permitted project are considered a part of the project and shall be addressed in the SWP3.

2. *Stabilization Practices*: The SWP3 must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be avoided.

The following records shall be maintained and attached to the SWP3: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.

Except as provided in Parts 4.5.6.A.2.a, b, and c below, stabilization measures shall be initiated within 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

a. Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently ceased is precluded by adverse climatological conditions (i.e. snow, ice, heavy rains, or drought) stabilization measures shall be initiated as soon as practicable.

b. Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 21 days, temporary stabilization measures do not have to be initiated on that portion of the site.

c. In arid areas (areas with an average annual rainfall of 0 to 10 inches), semiarid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonably arid conditions, stabilization measures shall be initiated as soon as practicable.

3. *Structural Practices:* The SWP3 must include a description of structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Structural practices may include but are not limited to: silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA.

   a. For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2 year, 24 hour storm from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin.

      In determining whether installing a sediment basin is attainable, the permittee may consider factors such as site soils, slope, available area on site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. For drainage locations that serve ten (10) or

more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps should be used. Where neither the sediment basin nor equivalent controls are attainable due to site limitations, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. The DEQ encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

b. For drainage locations serving less than 10 acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2 year, 24 hour storm or 3,600 cubic feet of storage per acre drained is provided. The DEQ encourages the use of a combination of sediment and erosion control measures in order to achieve maximum pollutant removal.

B. Storm Water Management

A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included in the SWP3. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may also require a separate permit under Section 404 of the CWA. Permittees are only responsible for the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with construction activity have been eliminated from the site. However, post-construction storm water BMPs that discharge pollutants from point sources once construction is completed, may in themselves need authorization under a separate OPDES permit.

1. Such practices may include but are not limited to: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (that combine several practices). The SWP3 shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

2. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. no significant changes in the hydrological regime of the receiving water).

C. Other Controls

1. No solid materials, including building materials, shall be discharged to waters of the State, except as authorized by a permit issued under Section 404 of the CWA.

2. Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

3. The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer, or septic system regulations to the extent these are located within the permitted area.

4. The SWP3 shall include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWP3 shall also include a description of controls to reduce pollutants from these materials, including storage practices to minimize exposure of the materials to storm water, and spill prevention and response.
5. The SWP3 shall include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.
6. The SWP3 shall include a description of measures necessary to protect listed endangered or threatened species or critical habitat, including any terms or conditions that are imposed under the eligibility requirements of Part 1.3.2.E.2 of this permit, unless a determination indicated that no impact is imminent. Failure to describe and implement such measures will result in storm water discharges from construction activities that are ineligible for coverage under this permit.

D. Approved State or Local Plans

Permittees which discharge storm water associated with construction activities must ensure their SWP3 is consistent with requirements specified in applicable sediment and erosion site plans of site permits, or storm water management site plans, or site permits approved by State or local officials. The SWP3 must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment erosion site plans or site permits, or storm water management site plans or site permits approved by State or local officials for which the permittee receives written notice.

4.5.7. Maintenance

All erosion and sediment control measures and other protective measures identified in the SWP3 must be maintained in effective operating condition. If site inspections required by Part 4.5.8 identify BMPs that are not operating effectively, maintenance shall be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If existing BMPs need to be modified or if additional BMPs are necessary for any reason, implementation must be completed before the next storm event whenever practicable. If maintenance prior to the next anticipated storm event is impracticable, the situation must be documented in the SWP3 and maintenance must be scheduled and accomplished as soon as possible.

4.5.8. Inspections

Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site, at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

Where sites have been finally or temporarily stabilized, runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0 to 10 inches) and semi-arid areas (areas with an average annual rainfall of 10 to 20 inches) such inspections shall be conducted at least once every month until the permit has been terminated.

Inspections should at a minimum consist of the following items:

A. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWP3 shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

B. Based on the results of the inspection, the SWP3 shall be modified as necessary (e.g., show additional controls on map required by Part 4.5.1; revise description of controls required by Part 4.5.6) to include additional or modified BMPs designed to correct problems identified. Revisions to the SWP3 shall be completed within 7 calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed before the next anticipated storm event. If implementation before the next anticipated storm event is impracticable, they shall be implemented as soon as practicable.

C. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation of the SWP3 shall be made and retained as part of the SWP3 for at least 3 years from the date that the site is finally stabilized. Major observations should include: the location(s) of discharges of sediment or other pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location; and location(s) where additional BMPs are needed that did not exist at the time of inspection. Actions taken in accordance with Part 4.5.8.B of this permit shall be made and retained as part of the SWP3 for at least three (3) years from the date that the site is finally stabilized. Such reports shall identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the SWP3 and this permit. The report shall be signed in accordance with Part 6.7 of this permit.

4.5.9. Non-Storm Water Discharges

Non-storm waters listed in Part 1.3.1.C of this permit that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

4.6. Contractor Certifications

This procedure is initiated only at the discretion of the permittee with the cooperation and agreement of the contractor. The Contractor Certification form, Addendum D should be rewritten by the permittee to fit their specific objectives. Contractor Certification is recommended but is not a requirement of the DEQ.

4.6.1. Contractors, subcontractors, builders, installers, regular suppliers, support service companies or others who are not the permittee (hereinafter referred to in Part 4.5. as “contractor”) but are involved in construction activity, and have not been issued a construction general permit authorization, should execute a Contractor Certification, at the discretion of the permittee, which places the responsibility of complying with and abiding by the intent and purpose of the permit with the contractor for work performed under the authority and direction of the

contractor. Contractors must ensure that activities regulated by the Construction General Permit (Permit) are protective of endangered and threatened species and critical habitat according to Part 11.

4.6.2. Contractors must be thoroughly familiar with and adhere to the NOI, the SWP3, and BMPs. The SWP3 should clearly identify, for each control measure identified in the plan, the party which will implement the measure. The Permittee(s) should ensure that all contractors or others involved in construction activity are identified in the plan as being responsible for implementing storm water control measures, and sign a copy of the contractor certification, before performing any work in the area covered by the SWP3. All contractor certifications should be included with the SWP3.

4.6.3. The Contractor Certification should include the name and title of the person providing the signature, the name, address, and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made. An example of certification can be found in Addendum D of the permit.

Part 5 Retention of Records

5.1. Documents

The permittee shall retain copies of the SWP3 and all reports required by this permit, and records of all data used to complete the NOI to be covered by this permit, for a period of at least three years from the date that the site is finally stabilized. This period may be extended by request of the Director at any time.

5.2. Accessibility

The permittee shall retain a copy of the SWP3 required by this permit (including a copy of the permit language) at the construction site (or other local location accessible to the Director; a State or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; or the operator of a municipal separate storm sewer receiving discharges from the site) from the date of project initiation to the date of final stabilization. Permittees with day-to-day operational control over SWP3 implementation shall have a copy of the SWP3 available at a central location on-site for the use of all operators and those identified as having responsibilities under the SWP3 whenever they are on the construction site.

5.3. Addresses

All written correspondence concerning this permit, including the submittal of NOIs and NOTs, shall be sent to the following address: Department of Environmental Quality, Environmental Complaints and Local Services, Storm Water Unit, P.O. Box 1677, Oklahoma City, OK 73101-1677.

Part 6 Standard Permit Conditions

6.1.Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissue, or modification, or for denial of a permit renewal application. Penalties for violations of permit conditions are provided below:

6.1.1. Criminal

A. *Negligent Violations*: The OPDES Act provides that any person who negligently violates permit conditions is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or both (27A O.S. § 2-6-206 (G) (1)).

B. *Knowing Violations*: The OPDES Act provides that any person who knowingly violates permit conditions is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both (27A O.S. § 2-6-206 (G) (2)).

C. *Knowing Endangerment:* The OPDES Act provides that any person who knowingly violates permit conditions, and who knows at that time that he is placing another person in imminent danger of death or serious bodily injury, is subject to a fine of not more than $250,000, or by imprisonment for not more than 15 years, or both (27A O.S. § 2-6-206 (G) (3)).

D. *False Statement:* The OPDES Act provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the OPDES, or who knowingly falsifies, tampers with, or renders inaccurate, any monitoring device or method required to be maintained under the OPDES, shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than two years, or by both. If a conviction is for a violation committed after a first conviction of such person under this paragraph, punishment shall be by a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four years, or by both (27A O.S. § 2-6-206 (G) (4)).

6.1.2. Civil Penalties: The OPDES Act provides that any person who violates a permit condition is subject to a civil penalty not to exceed $10,000 per day for each violation (27A O.S. § 2-6-206 (F)).

6.1.3. Administrative Penalties: The OPDES Act provides that any person who violates a permit condition is subject to an administrative penalty, not to exceed $10,000 per violation nor shall the maximum amount exceed $125,000 (27A O.S. § 2-6-206 (E)).

6.2. Continuation of the Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued and remain in full force and effect. Any permittee who was granted permit coverage prior to the expiration date will automatically remain covered by the continued permit until the earlier of:

6.2.1. Reissue or replacement of this permit, at which time the permittee must comply with the Notice of Intent conditions of the new permit to maintain the authorization to discharge; or

6.2.2. The permittee's submittal of a Notice of Termination; or

6.2.3. Issuance of an individual permit for the permittee's discharges; or

6.2.4. A formal permit decision by the Director not to reissue this general permit, at which time the permittee must seek coverage under an alternative general permit or an individual permit.

6.3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6.4. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

6.5. Duty to Provide Information

The permittee shall furnish to the Director, or an authorized representative of the Director, any information that is requested to determine compliance with this permit or other information.

6.6. Other Information

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the NOI or in any other report to the Director, he or she shall promptly submit such facts or information.

6.7. Signatory Requirements

All Notices of Intent, Notices of Termination, reports, certifications (except the Contractor Certification under Part 4.6.) or information either submitted to the Director or the operator of an MS4, or that this permit requires be maintained by the permittee, shall be signed as follows:

6.7.1. All Notices of Intent and Notices of Termination shall be signed as follows:

A. For a corporation: by a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

B. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

C. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this Section, a principal executive officer of a Federal agency includes (i) The chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrator of the EPA).

6.7.2 All reports required by this permit and other information requested by the Director or authorized representative of the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

A. The authorization is made in writing by a person described above and submitted to the Director;

B. The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator, superintendent, or position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

C. The signed and dated written authorization must be included in the SWP3.

6.7.3 Changes to Authorization: If an authorization under Part 2.2 is no longer accurate because a different operator has responsibility for the overall operation of the construction site, a new NOI satisfying the requirements of Part 2.2 must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative. The change in authorization must be submitted within the time frame specified in Part 2.1.2 and sent to the address specified in Part 2.3.

6.7.4 Any person signing documents under Part 6.7 shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

6.8 Penalties for Falsification of Reports

Section 27A O.S. § 2-6-206 G. 4. provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than two years, or by both.

6.9 Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act (CWA) or Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") of 1980, 42 USC § 9601 et. seq.

6.10 Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

6.11 Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

6.12 Requiring an Individual Permit or an Alternative General Permit

A. The Director may require any person authorized by this permit to apply for and/or obtain either an individual OPDES permit or an alternative OPDES general permit. Any interested person may petition the Director to take action under this paragraph. Where the Director requires a permittee authorized to discharge under this permit to apply for an individual OPDES permit, the Director

shall notify the permittee in writing that a permit application is required. This notification shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the permittee to file the application, and a statement that on the effective date of issuance or denial of the individual OPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Applications shall be submitted to the address in Part 2.3 of this permit. The Director may grant additional time to submit the application upon request of the applicant. If a permittee fails to submit in a timely manner an individual OPDES permit application as required by the Director under this paragraph, then the applicability of this permit to the individual OPDES permittee is automatically terminated at the end of the day specified by the Director for application submittal.

B. Any permittee authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. In such cases, the permittee shall submit an individual application in accordance with the requirements of 40 CFR 122.26 (c) (1) (ii), with reasons supporting the request, to the Director at the address in Part 2.3 of this permit. The request may be granted by issuance of any individual permit or an alternative general permit if the reasons cited by the permittee are adequate to support the request.

C. When an individual OPDES permit is issued to a permittee otherwise subject to this permit, or the permittee is authorized to discharge under an alternative OPDES general permit, the applicability of this permit to the individual OPDES permittee is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. When an individual OPDES permit is denied to an operator otherwise subject to this permit, or the owner/operator is denied coverage under an alternative OPDES general permit, the applicability of this permit to the individual OPDES permittee is automatically terminated on the date of such denial, unless otherwise specified by the Director.

6.13. State/Tribal Environmental Laws

6.13.1. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State/Tribal law or regulation under authority preserved by Section 510 of the Clean Water Act.

6.13.2. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

6.13.3. Construction activities on Indian Country Lands are regulated by the EPA Region 6 offices located in Dallas, Texas. Applicants seeking coverage for construction or surface disturbing activities located on Indian Country land should contact the EPA Region 6 office.

6.14. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions and requirements of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of this permit.

6.15. Inspection and Entry

The permittee shall allow the Director or an authorized representative of DEQ, or in the case of a construction site that discharges through a municipal separate storm sewer, an authorized representative of the municipal owner/operator of the separate storm sewer receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

6.15.1 Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

6.15.2 Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

6.15.3 Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

6.16 Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Part 7 Re-opener Clause

7.1 Potential to Cause or Contribute to a Violation

If there is evidence indicating that the storm water discharges authorized by this permit cause, or have the reasonable potential to cause, or contribute to, a violation of a water quality standard, the permittee may be required to obtain an individual permit or an alternative general permit in accordance with Part 6.12 of this permit, or the permit may be modified to include different limitations and/or requirements.

7.2 Permit Modification or Revocation

Permit modification will be conducted according to the Oklahoma Uniform Environmental Permitting Act at Oklahoma Statutes, Title 27A, Section 2-14-101 et. seq., the Oklahoma Administrative Code (OAC), 252:4-7 and 252:606 incorporating by reference Federal Regulations at 40 CFR 122.62, 122.63, 122.64, and 124.5.

The DEQ may propose a modification to this permit after further discussions between the Department and the Oklahoma Historical Society for the protection of historic properties.

Part 8 Termination of Coverage

8.1 Notice of Termination (NOT)

Permittees must submit a completed NOT that is signed in accordance with Part 6.7 of this permit when one or more of the conditions contained in Part 1.5.2. (Terminating Coverage) have been met at a construction project. The NOT form found in Addendum C will be used unless it has been replaced with a revised version by the Director.

8.1.1 The Notice of Termination shall include the following information:

A. The OPDES permit number for the storm water discharge identified by the NOT;

B. An indication of whether the storm water discharges associated with construction activity have been eliminated (i.e., regulated discharges of storm water are being terminated) or the permittee is no longer an operator at the site;

C. The name, address, and telephone number of the permittee submitting the NOT;

D. The name of the project and street address (or a description of location if no street address is available) of the construction site for which the notification is submitted;

E. The latitude and longitude of the construction site.

F. The information pertaining to the new operator if you are no longer an operator of the site, including the name, address, and phone number, and

G. The following certification, signed in accordance with Part 6.7 (signatory requirements) of this permit. For construction projects with more than one permittee and/or operator, the permittee need only make this certification for those portions of the construction site where the permittee was authorized under this permit and not for areas where the permittee was not an operator:

"I certify under penalty of law that all storm water discharges associated with industrial/construction activity from the identified facility/site that was authorized by a general permit have been eliminated or that I am no longer the owner or operator of the facility/site. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with industrial/construction activity under this general permit, and that discharging pollutants in storm water associated with industrial/construction activity to waters of the State of Oklahoma is unlawful under the Clean Water Act and OAC 252:606-1-3(b)(3)(L) where the discharge is not authorized by an OPDES permit. I also understand that the submittal of this Notice of Termination does not release me as an owner or operator from liability for any violations of this permit or the Clean Water Act."

8.1.2 Elimination of Storm Water Discharged

For the purposes of this certification, elimination of storm water discharges associated with construction activity means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized (as defined in Part 9) and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time to ensure final stabilization is maintained, or that all storm water discharges associated with construction activities from the identified site that are authorized by an OPDES general permit have otherwise been eliminated from the portion of the construction site where the operator had control.

8.1.3 Address

All NOTs signed in accordance with Part 6.7 of this permit are to be submitted using the form provided by the Director (or a photocopy thereof), to the address found in 5.3.

Part 9 Definitions

1. **Applicant** means any person who is contemplating or planning to submit an NOI for approval, or has submitted an NOI for approval and is waiting for authorization to discharge storm water under the provisions of this permit.

2. **Best Management Practices (BMPs)** means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the State. BMPs also include treatment requirements, operating procedures,

and practice to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

3. **Commencement of Construction** means the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.
4. **Control Measure** as used in this permit, refers to any BMP or other method used to prevent or reduce the discharge of pollutants to waters of the State.
5. **CWA** means the Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C. Section 1251 et seq.
6. **Dewatering Activities** means the discharge of water generated from the lowering of the groundwater table, the pumping of accumulated storm water from an excavation, or the pumping of surface water from a cofferdam.
7. **Director** means the Executive Director or chief administrator of the DEQ or an authorized representative.
8. **Discharge** when used without qualification means the "discharge of a pollutant."
9. **Discharge of Storm Water Associated with Construction Activity** as used in this permit, refers to a discharge of pollutants in storm water runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavation), construction materials or equipment storage or maintenance (e.g., fill piles, borrow area, concrete truck washout, fueling), or other industrial storm water directly related to the construction process (e.g., concrete or asphalt batch plants) are located.
10. **Ephemeral Stream** means an entire stream which flows only during or immediately after a rainfall event, and contains no refuge pools capable of sustaining a viable community of aquatic organisms.
11. **Facility or Activity** means any OPDES "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the OPDES program.
12. **Final Stabilization** means that**:**

    12.1. All soil disturbing activities at the site have been completed and either of the two following criteria is met:

    A. A uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or

    B. Equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

    When background native vegetation covers less than 100% of the ground (e.g., arid areas, and beaches), establishing at least 70% of the natural cover of the native vegetation meets the vegetative cover criteria for final stabilization (e.g., if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover for final stabilization. On a beach with no natural vegetation, no vegetation is required.

    12.2. For individual lots in residential construction, either of the following criteria is met:

    A. The homebuilder has completed final stabilization as specified above; or

    B. The homebuilder has established temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization. (Homeowners typically have

an incentive to put in the landscaping functionally equivalent to final stabilization as quickly as possible to keep mud out of their homes and off sidewalks and driveways.); or

12.3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to "waters of the United States," and areas that are not being returned to their pre-construction agricultural use must meet the final stabilization criteria 12.1 or 12.2 above.

13. Municipal Separate Storm Sewer System or MS4 is defined at 40 CFR §122.26(b)(8) to mean a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

13.1. Owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

13.2. Designed or used for collecting or conveying storm water;

13.3. Which is not a combined sewer; and

13.4. Which is not part of a Public Owned Treatment Works (POTW) as defined at 40 CFR §122.2.

Note: Phase II MS4 can also be owned or operated by Federal and State government, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. [see 40 CFR §122.26(b)(16)]

14. NOI means Notice of Intent, (DEQ Form 605-002A, see Part 2 of this permit.)

15. NOT means Notice of Termination (DEQ Form 605-003, see Part 8 of this permit).

16. Owner/Operator for the purpose of this permit and in the context of storm water associated with construction activity, means any party defined in 16.1 or 2, associated with a construction project that meets either of the following two criteria:

16.1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

16.2. The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a Storm Water Pollution Prevention Plan for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWP3 or comply with other permit conditions).

This definition is provided to inform permittees of DEQ's interpretation of how the regulatory definitions of "owner or operator" and "facility or activity" are applied to discharges of storm water associated with construction activity.

17. OPDES means the Oklahoma Pollutant Discharge Elimination System Act.

18. Outstanding Resource Waters means those waters of the State which are designated as such in Oklahoma's Water Quality Standards OAC 785:45, Appendix A..

19. **Permit** means the General Permit OKR10 for Storm Water Discharges from Construction Activities Within the State of Oklahoma.
20. **Permittee** means a person who has submitted an NOI and has received authorization to discharge storm water from construction or land disturbing activities under this permit.
21. **Point Source** means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, landfill leachate collection system, or vessel or other floating craft, from which pollutants or wastes are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
22. **Pollutant** means any material, substance, or property which may cause pollution (e.g., dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste).
23. **Runoff coefficient** means the fraction of total rainfall that will appear at the conveyance as runoff.
24. **Storm Water** means rainwater runoff, snowmelt runoff, and surface runoff and drainage.
25. **Storm Water Associated with Industrial Activity** is defined at 40 CFR 122.26 (b) (14) & (15) and incorporated here by reference. Most relevant to this permit is 40 CFR 122.26 (b) (14) (x) and 40 CFR 122.26 (b) (15) (i), that relates to construction activity including clearing, grading, and excavation activities that result in the disturbance of one or more acres of total land area, or are part of a larger common plan of development or sale.
26. **Storm Water Discharge-Related Activity** is defined as disturbance activities that cause, contribute to, or result in point source storm water pollutant discharges, including but not limited to excavation, site development, grading, and other land disturbing activities; and control measures to control storm water discharges including the siting, construction, and operation of best management practices (BMPs) to control, reduce, or prevent storm water pollution.
27. **Takes or Taking** means any action that would "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any threatened or endangered species. Harm may include significant habitat modification that actually injures a species.
28. **Total Maximum Daily Load or TMDL** means the sum of the individual wasteload allocations (WLAs) for point sources, safety, reserves, and loads from nonpoint sources and natural background.
29. **Waters of the State** means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, storm sewers and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow through, or border upon this state or any portion there of, and shall include under all circumstances the waters of the United States which are contained within the boundaries of, flow through, or border upon this state or any portion thereof. Provided waste treatment systems, including treatment ponds or lagoons designed to meet federal and state requirement other than cooling ponds as defined in the Clean Water Act or rules promulgated thereto, and prior converted cropland are not waters of the State. (27A O.S. §1-1-201).

Part 10. Historic Preservation

The Environmental Protection Agency has determined that the Oklahoma Department of Environmental Quality's NPDES permitting activities are not Federal undertakings and, therefore,

are not subject to review under Section 106 of the National Historic Preservation Act. However, applicants and permittees must comply with the State Antiquities Act (Title 53, Chapter 20, Section 361) where applicable and the Burial Desecration Law (Title 21, Chapter 47, Section 1168.0-1168.6), as well as with any applicable local laws concerning the identification and protection of historic properties.

Applicants and permittees who may receive Federal funding or other Federal assistance in the completion of their projects must be aware that compliance with Section 106 of the Act may apply. For information about the Section 106 review process in Oklahoma, Oklahoma properties listed on or eligible for the National Register of Historic Places, and related topics, contact:

State Historic Preservation Office
Oklahoma Historical Society
2401 North Laird Avenue
Oklahoma City, OK 73105
(405)521-6249
www.okhistory.org/shpo/shpom.htm

Oklahoma Archeological Survey
111 East Chesapeake
Norman, OK 73019
405/325-7211
www.ou.edu/cas/archsur

Part 11 Endangered Species

Addendum A is a registry of Federal identified sensitive waters and watersheds and State identified sensitive waters and watersheds.

11.1 Background

The DEQ is seeking to ensure the activities regulated by the Permit are protective of endangered and threatened species and critical habitat. To ensure that those goals are met, owners/operators seeking Permit coverage are required under Part 1.3.2.E to assess the impacts of their storm water discharges and storm water discharge-related activities on identified endangered and threatened species and designated critical habitat. This may be accomplished by following Steps 1 and 2 listed below. It is not necessary to contact the appropriate wildlife agency if you can comply with the provisions listed in Step 2. The DEQ strongly recommends that applicants follow these steps at the earliest possible stage to ensure that measures to protect identified species are incorporated early in the planning process. At minimum, the procedures should be followed when developing the SWP3.

Permittees and contractors have an independent obligation to ensure that their activities do not result in any prohibited “take” of identified species. Many of the measures required in the Permit and in these instructions to protect identified species may also assist owners/operators in ensuring that their construction or land disturbing activities do not result in a prohibited take of a species. Owners/operators who plan construction or land disturbing activities within the corridor of a Federally identified sensitive water or a State identified sensitive water, Addendum A, may meet the requirements of Step 2.

This permit provides for the possibility of multiple owners/operators and contractors at a construction site. Applicants should be aware that in some cases they may meet the permit eligibility requirements by relying on another permittee’s certification of eligibility under Part 1.3.2.E.2.a., b., c., d. or e. This

is allowed under Part 1.3.2.E.2.e. of the permit, however, the other permittee's certification must apply to the contractor's project area and must address the effects from the Contractor's storm water discharges and storm water discharge-related activities on listed species and critical habitat. By certifying eligibility under Part 1.3.2.E.2.e. the applicant agrees to comply with any measures or controls upon which the other operator's certification under Part 1.3.2.E.2.a., b., c., d. or e. was based. This situation will typically occur where a developer or primary contractor, such as one for construction of a subdivision or industrial park, conducts a comprehensive assessment of effects on listed species for the entire construction project, certifies eligibility under Part 1.3.2.E.2.a., b., c., d. or e. and that certification is relied upon by other operators (i.e., contractors) at the site. However, applicants that consider relying on another operator's certification should carefully review that certification along with any supporting information. If an applicant does not believe that the operator's certification provides adequate coverage for the applicant's storm water discharges and storm water discharge-related activities or for the applicant's particular project area, the applicant should provide its own independent certification under Part 1.3.2.E.2..a., b., c., d. or e.

11.2 Procedures

To receive coverage under the Construction General Permit, applicants must assess the potential effects of their storm water discharges and storm water discharge-related activities on listed species. To make this assessment, applicants must follow the steps outlined below prior to completing and submitting a Notice of Intent (NOI) form, Addendum B.

Step 1: Determine Whether The Project Area Drains To Sensitive Waters Or Watersheds.

1. Refer to Addendum A, that lists all of the waters of Oklahoma which the U.S. Fish and Wildlife Service and the Oklahoma Department of Wildlife Conservation consider to be sensitive because they harbor populations of federal or state listed species or their designated critical habitat.
2. If the applicant's proposed construction site is not located within any of these areas, the proposed construction storm water discharge or storm water discharge related activities are not likely to significantly affect endangered and threatened species. The applicant may then skip Step 2 and further investigation is unnecessary.
3. If the applicant's proposed construction site is located within the corridor of any sensitive waters or watersheds, the applicant must continue on to step 2.

Step 2: Implementation of Storm Water Control Measures to Protect Endangered and Threatened Species in Sensitive Rivers:

1. Applicants whose proposed construction site is located within a sensitive water or watershed must incorporate the following measures into the SWP3 for this site. Other pollutants such as, but not limited to, oil, grease, solid waste (i.e. building material scrap, and trash), and human and hazardous waste, (e.g., paint and solvents), are not authorized for discharge under this permit. These potential pollutants must be properly managed and their contact with storm water minimized or eliminated to the greatest extent practicable.

a. Consistent with Part 4.5.6.A.1, sediment must be retained on site to the greatest extent practicable; all sediment, solid waste, and human waste control measures must be properly installed and maintained at all times; and off-site accumulations of any escaped sediment must be removed.

b. A vegetated buffer zone of at least 100 feet must be retained or successfully established/planted between the area disturbed during construction and all perennial or intermittent streams on or adjacent to the construction site. A vegetated buffer zone at least 50 feet wide must be retained or

successfully established/planted between the areas disturbed during construction and all ephemeral streams or drainages. Buffer zones shall be measured from the top of the first defined bank of the stream and shown on the site map in the SWP3.

c. Consistent with Part 4.5.6.A.2, an implementation schedule must be included which describes the stabilization practices that will be used to control erosion during construction and when construction has permanently ceased. The preservation of mature vegetation on-site is preferred.

d. Consistent with Part 4.5.6.A.3, structural BMPs must be successfully implemented to divert uphill storm water flows from crossing disturbed areas, to store flows (e.g., retention ponds) or to otherwise control runoff from disturbed areas during construction. At a minimum this must include silt fencing and vegetated buffer strips on all down slope boundaries of the area disturbed during construction. The construction of temporary or permanent storm water detention or retention structures (e.g., ponds) is preferred, but these should not be constructed within intermittent or perennial stream channels or within floodplains.

e. Consistent with Part 4.5.6.B.2, velocity dissipation devices must be incorporated into the design of outfall channels and discharge locations. Outfalls must be screened to prevent the discharge of solid materials with storm water runoff.

f. Hazardous construction materials and waste must be stored in a manner that minimizes their contact with storm water. An emergency response plan must be included which addresses the handling of accidental spills.

2. The applicant must comply with any terms and conditions imposed under the eligibility requirements of Part 1.3.2.E.2 a, b, c, d, or e to ensure that its storm water discharges and storm water discharge-related activities are protective of listed species and/or critical habitat. Such terms and conditions must be incorporated in the project's SWP3. If the eligibility requirements of Part 1.3.2.E.2 a, b, c, d, or e cannot be met, the applicant may seek relief from the appropriate service in the form of an approved take. As an alternative, the applicant may seek coverage under a DEQ individual permit.

Addresses:

U. S. Fish and Wildlife Service
9014 East 21st Street
Tulsa, OK 74129
(918) 581-7458

Oklahoma Department of Wildlife Conservation
1801 North Lincoln Blvd.
Oklahoma City, OK 73105
(405) 521-3851

Oklahoma Natural Heritage Inventory
111 East Chesapeake
Norman, OK 73019
(405) 325-1985

The Oklahoma Natural Heritage Inventory has a very comprehensive database of endangered and threatened species locations. They can provide valuable information to help you in making determinations, but they have no authority to issue authorizations.

ADDENDUM A – Oklahoma Sensitive Waters and Watersheds Harboring Endangered and Threatened Species and Their Critical Habitat of Concern

A. Sensitive waters and watersheds for federal listed species, as identified by the U.S. Fish & Wildlife Service for the DEQ construction storm water general permit.

Grand (Neosho) River - A two-mile corridor (one mile from each bank) of the main stem of the Grand (Neosho) River above its confluence with Tar Creek. Includes portions of Ottawa and Craig Counties.

Arkansas River - A two-mile corridor (one mile from each bank) of the main stem of the Arkansas River between the Oklahoma/Arkansas state line and the Kaw Reservoir dam (excluding the flood pool of Keystone Reservoir). Includes portions of Sequoyah, Haskell, LeFlore, Wagner, Muskogee, Tulsa, Osage, Pawnee, and Noble and Kay Counties.

Cimarron River - A two-mile corridor (one mile from each bank) of the main stem of the Cimarron River from the flood pool of the Keystone Reservoir upstream to and including Beaver County. Includes portions of Creek, Payne, Logan, Kingfisher, Major, Woods, Woodward, Harper, and Beaver Counties.

South Canadian River - A two-mile corridor (one mile from each bank) of the main stem from the confluence with the Arkansas River (excluding the Eufaula Reservoir flood pool upstream to the Texas state line, and the river segment in Haskell, McIntosh, Pittsburg, Hughes, Pontotoc, Seminole, Pottawatomie, McClain, Cleveland, Canadian, Grady, Caddo, Blaine, Custer, Dewey, Ellis, and Roger Mills Counties.

Muddy Boggy River - A two-mile corridor (one mile from each bank) of the main stem of the Muddy Boggy River. Includes portions of Choctaw, Atoka, and Coal Counties.

Kiamichi River – The **watershed** of the Kiamichi River upstream from the Hugo Reservoir. Includes portions of Pushmataha, Atoka, Pittsburg, Latimer, and Leflore Counties.

Red River - A one-mile corridor (one mile from the north bank) along the main stem of the Red River except the Texhoma Reservoir. Includes portions of McCurtain, Choctaw, Bryan, Love, Jefferson, Cotton, Tillman, Jackson, and Harmon Counties.

Little River – The **watershed** of the Little River. Includes portions of LeFlore, Pushmataha and McCurtain Counties.

Glover River – The **watershed** of the Glover River. Includes portions of Pushmataha and McCurtain Counties.

Mountain Fork River – The **watershed** of the Mountain Fork River above Broken Bow Reservoir. Includes portions of Leflore and McCurtain Counties.

Northeast HUC-11 Watersheds – The **watersheds** are identified by the following 11-digit Hydrologic Unit Codes: 11070207190, 11070206060, 11070209030, 11070209050, 11070209060*, 11070209040 and 11070209070. The watersheds include portions of Ottawa, Craig, Delaware, and Mayes Counties.

* This HUC does not contain a known Ozark cavefish cave. It was included because it is entirely surrounded by 11 digit HUCs with known Ozark cavefish caves, therefore we assume that Ozark cavefishes likely occupy this portion of the aquifer.

Spring River – A two-mile corridor (one mile from each bank) of the Spring River. Includes portions of Ottawa County.

B. Sensitive waters and watersheds for State listed species, as identified by the Oklahoma Department of Wildlife Conservation for the DEQ construction storm water general permit.

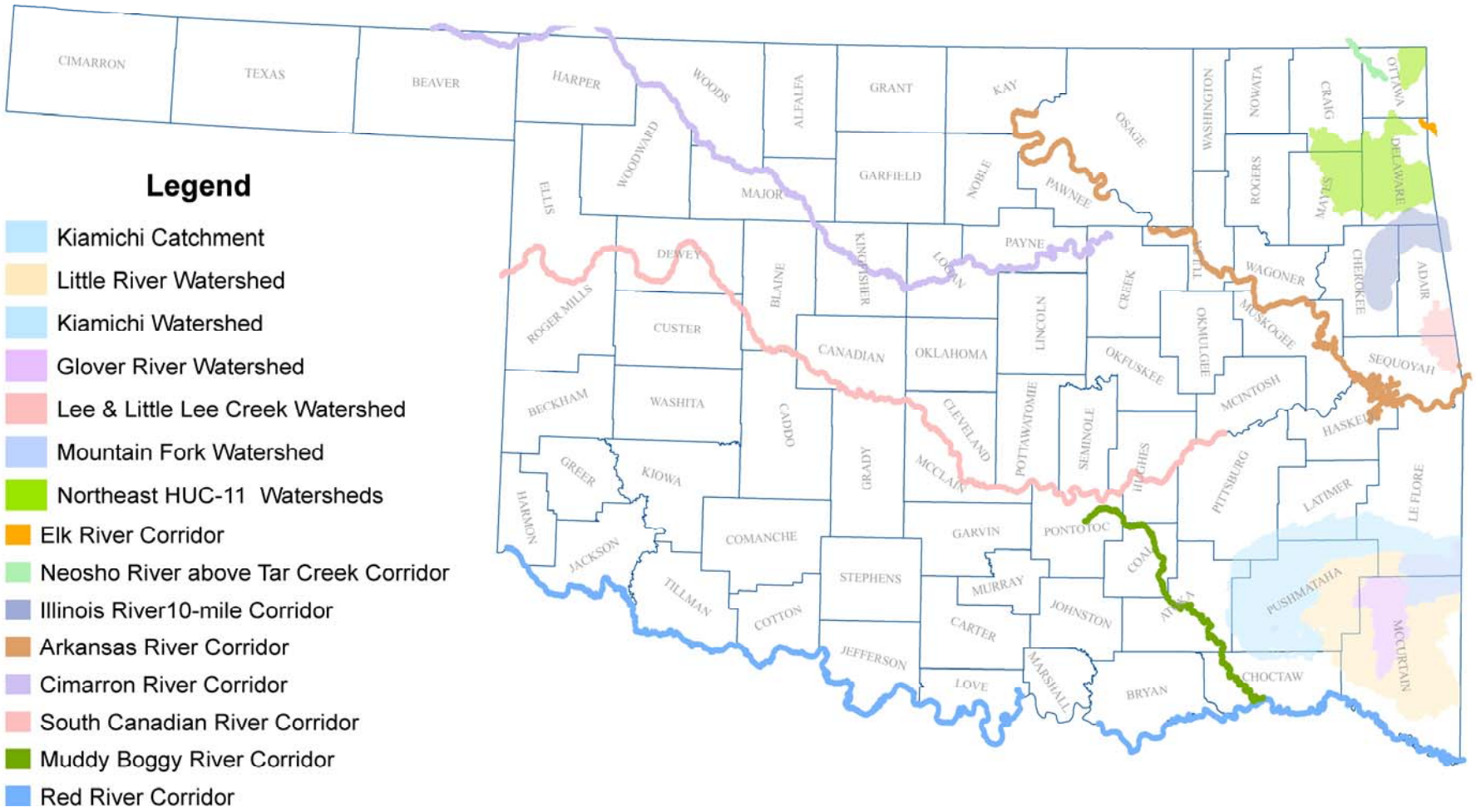
Illinois River – A **ten-mile** corridor (five miles from each bank within the watershed) of the main stem of the Illinois River above the Tenkiller Reservoir. Includes portions of Cherokee, Delaware and Mayes Counties.

Lee and Little Lee Creeks – The **watershed** of Lee Creek and Little Lee Creek. Includes portions of Sequoyah and Adair Counties.

Note: No storm water discharge-sensitive endangered or threatened species occur in the following counties: Cimarron, Texas, Beckham, Greer, Washita, Kiowa, Alfalfa, Comanche, Grant, Garfield, Oklahoma, Garvin, Murray, Stephens, Carter, Lincoln, Johnston, Okfuskee, Okmulgee, Washington, Nowata, and Rogers.

Oklahoma Sensitive Waters and Watersheds for Federal & State listed Species

as identified by the U.S. Fish & Wildlife Service and the Oklahoma Department of Wildlife Conservation



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ADDENDUM B –NOTICE OF INTENT

See Reverse Side for Instructions

DEQ FORM 605-002A September 13, 2007		Oklahoma Department of Environmental Quality Notice of Intent (NOI) for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY on Sites of One Acres or More Acres Under the OPDES General Permit OKR10

SUBMISSION OF THIS NOTICE OF INTENT CONSTITUTES NOTICE THAT THE PARTY IDENTIFIED IN Part I OF THIS FORM INTENDS TO BE AUTHORIZED BY AN OPDES PERMIT ISSUED FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY IN THE STATE OF OKLAHOMA. BECOMING A PERMITTEE OBLIGATES SUCH DISCHARGER TO COMPLY WITH THE TERMS AND CONDITIONS OF THE PERMIT. IN ORDER TO OBTAIN AUTHORIZATION, ALL REQUESTED INFORMATION MUST BE PROVIDED ON THIS FORM. SEE INSTRUCTIONS ON BACK OF FORM.

IF YOUR FACILITY OR SITE IS ON INDIAN COUNTRY LAND, FILE YOUR NOI WITH THE EPA, USING EPA FORM 3510-9.

☐ **NEW APPLICATION** ☐ **MODIFICATION OF CURRENT PERMIT Enter Authorization Number: OKR10_____**

I. Facility Owner/Operator Information

If you are a Co-permittee, check this box ☐

Name: _____Phone: (_____)_____

Address: _____ Status of Owner/Operator: _____

City: _____ State: _____ Zip Code: _____ E-mail Address: _____

II. Site Information

Name of the project: _____Address: _____

City:_____ County: _____ ZIP Code: _____

Telephone No. (_____)_____ **Location:** Latitude: _____ Longitude: _____

Has a Storm Water Pollution Prevention Plan (SWP3) been developed? ☐ Yes ☐ No

Address of location of SWP3 for viewing: ☐ Address in I. Above. ☐ Address in II. Above. ☐ Other, please specify below.

Address: _____ Phone: (_____)_____

City: _____ Zip Code: _____

Name of Receiving Water Body: _____

Is the Receiving Water Body on the DEQ 303(d) list? ? ☐ Yes ☐ No Is this facility/site on Indian Country land? ☐ Yes ☐ No (See Instructions)

Is there an approved TMDL or watershed plan applicable to this site? ☐ Yes ☐ No

Is this site a part of the common plan of development or sale? ☐ Yes ☐ No Estimated area to be disturbed (to nearest acre): _____

_____/_____/_____ _____/_____/_____
Month Day Year Month Day Year
Construction Start Date Estimated Completion Date

Is the Storm Water Pollution Prevention Plan in compliance with all Applicable local sediment and erosion plans?. ☐ Yes ☐ No ☐ None

ENDANGERED SPECIES

Based on the instructions provided in Part 11 and Addendum A of the permit, is the proposed construction or land disturbing activity within the corridor of any of the listed sensitive waters or watersheds?

☐ Yes ☐ No

If the answer is yes, please refer to Part 11.2 Step 2.

All permit eligibility requirements with regard to protection of endangered species through the indicated Section of Part 1.3.2.E.2 of the permit have been complied with. (check one or more boxes):

a. ☐ b. ☐ c. ☐ d. ☐ e. ☐

III. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I understand that continued coverage under this permit is contingent upon maintaining eligibility as provided for in Part 1.3.

Name (Please Print):_____ Date: _____

Signature:_____ Title_____

For DEQ use only: Assigned Authorization Number: OKR10 _____

Instructions – DEQ Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity to be Covered Under the OPDES General Permit OKR10

Who Must File A Notice Of Intent Form

Under the provisions of the Clean Water Act, as amended, (33 U.S. 1251 et.seq.....the Act), Oklahoma Environmental Code, Title 27A of the Oklahoma Statutes, Section 2-14-101 et. seq. and the rules OAC 252:004-15, discharge of storm water from construction activities is prohibited without an Oklahoma Pollutant Discharge Elimination System Permit. The operator of a construction site that has such a storm water discharge must submit an NOI to obtain coverage under an OPDES Storm Water General Permit (OKR10). If you have questions about whether you need a permit under the OPDES Storm Water program, or if you need information, write to the address listed below or telephone the Environmental Complaints and Local Services Division, Department of Environmental Quality (DEQ), at (405) 702-6100 and ask for the Storm Water Unit.

Where to File an NOI Form:

DEQ/Environmental Complaints and Local Services (ECLS)
Storm Water Unit
P.O. Box 1677
Oklahoma City, OK 73101-1677
FAX (405) 702-6223

Note: do not submit an SWP3 with the NOI, unless the project is located (1) within outstanding resource waters, or (2) within Federal and State sensitive waters and watersheds, or (3) within a lager site which is disturbing land of 40 or more acre.

Completing The Form

You must type or print, using upper-case letters, in the appropriate areas only. If you have any questions on this form, call DEQ-ECLS at (405) 702-6100 and ask for the Storm Water Unit.

Section I. Facility Owner/Operator Information
Provide the legal name, mailing address, and telephone number of the person, firm, public organization, or any other entity that either individually or together meet either of the following two criteria: (1) have operational control over the site specifications (including the ability to make modifications in specifications); and (2) have the day-to-day operational control of those activities at the site necessary to ensure compliance with plan requirements and permit conditions. If you are a Co-Permittee, check the appropriate box. Do not use a colloquial name.

Enter the appropriate letter to indicate the legal status of the operator of the facility: F = Federal; S = State; M = Public (other than Federal or State); P = Private.

Section II. Site Information
Enter the Project's official or legal name and complete street address, including city, county, state, ZIP code and phone number. If the site lacks a street address, indicate with a general statement the location of the site (e.g., Intersection of State Highways 61 and 34). The applicant must also provide the latitude and longitude of the facility in degrees, minutes, and seconds to the nearest 15 seconds (45º 7' 24" = 45.1234 decimal latitude) of the approximate center of the site.

The latitude and longitude of your facility can be located on USGS quadrangle maps. The quadrangle maps may be obtained at 1-800-USA MAPS. Longitude and latitude may also be obtained at the Census Bureau Internet site: http://www.census.gov/cgi-bin/gazetteer. Only one location description is needed: address; section, township, and range; or latitude and longitude.

Provide the address and phone number where the SWP3 may be viewed, if different from address previously given. Check appropriate box.

Enter the name of the receiving water body, the closest predominant receiving water body. The Oklahoma 303(d) list can be found online at http://www.deq.state.ok.us/WQDnew/305b_303d/index.html or the DEQ GIS Map and Data Viewer at http://maps.scigis.com/deq_wq/

If your facility or site is on Indian Country land, do not complete this form. File your NOI with the EPA using EPA Form 3510-9.

Indicate whether your discharge will be consistent with the conditions and requirements of EPA approved or established TMDLs. An approved TMDL report can be found online on the DEQ website at http://www.deq.state.ok.us/WQDnew/tmdl/index.html

Indicate whether your site is a part of the common plan of development or sale, which is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.

Enter the estimated area to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest acre.

Enter the construction start and estimated completion date using four digits for the year.

Indicate if the proposed construction site or land disturbing activity is within the corridor of a listed sensitive water or watershed, Addendum A of the General Permit, and associated with the discharges and requirements to be covered by this permit as follows, Part 1.3.2.E.2:

a The proposed construction site or land disturbing activity is not located within any of the corridors of the Federal or State identified sensitive waters or watersheds, and further investigation is not required.

b The proposed construction site or land disturbing activity is located within a corridor of a Federally or State identified sensitive water or watershed (Addendum A). The SWP3 describes this area in relation to the listed water or watershed and specifies the measures to be employed to protect the endangered or threatened species or their critical habitat.

c If applicant's storm water discharges and storm water discharge-related activities meet the criteria under Part 1.3.2.E.2.a, b, d, or e, there is no need to contact the U.S. Fish and Wildlife Service (USFWS) for Federal sensitive waters and watersheds or the Oklahoma Department of Wildlife Conservation (ODWC) for State sensitive waters (see Part 11). If one of those eligibility criteria cannot be met, applicants may contact those agencies for either a no jeopardy opinion or a finding that the storm water discharges are not likely to adversely affect listed species or critical habitat; or

d The applicant's construction activities are authorized by the appropriate Federal or State agency and that authorization addresses the incidental taking of listed species by the applicant's storm water discharge or storm water discharge-related activities; or

e The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part 1.3.2.E.2 a, b, c, or d that included the applicant's project area. By certifying eligibility under Part 1.3.2.E.2 f, the applicant agrees to comply with applicable measures or controls upon which the other operator's certification under Part 1.3.2.E.2 a, b, c or d was based.

Indicate if the SWP3 is in compliance with all other applicable local sediment and erosion plans.

Section III. Certification
Federal Statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:
For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manger is authorized to make management decisions which govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign had been assigned or delegated to the manager in accordance with corporate procedures.
For a partnership or sole proprietorship: by a general partner of the proprietor, or; For a municipality, state, Federal, or other public agency: by either a principal executive or ranking elected official.

ADDENDUM C – NOTICE OF TERMINATION

DEQ FORM 605-003 September 13, 2007		OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY NOTICE OF TERMINATION (NOT) FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL OR CONSTRUCTION ACTIVITY UNDER AN OPDES GENERAL PERMIT

Submission of this Notice of Termination constitutes notice that the party identified in Section I of this form is no longer authorized to discharge storm water associated with industrial or construction activities under the OPDES program.

All Requested Information Must Be Provided On This Form. See Instructions On The Back Of Form.

I. Permit Information: OPDES Storm Water General Permit Authorization Number: _____

Check here if you are no longer the operator of the facility/site: ☐

Check here if the storm water construction or industrial discharge is being terminated: ☐

II. Facility/Site Owner/Operator Information:

Name: _____ Phone: _____

Address: _____

City: _____ County: _____ Zip Code: _____

III. Facility/Site Location:

Name: _____

Address: _____

City: _____ County: _____ Zip Code: _____

Latitude: _____ Longitude: _____

IV. New Facility/Site Information:

If you are no longer the operator of the facility/site, provide the following information pertaining to the new operator at the facility/site:

Name: _____

Address: _____

City: _____ County: _____ Zip Code: _____

V. Certification:

I certify under penalty of law that all storm water discharges associated with industrial/construction activity from the identified facility/site that were authorized by a general permit have been eliminated or that I am no longer the owner or operator of the facility/site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial or construction activity under this general permit, and that discharging pollutants in storm water associated with industrial or construction activity to waters of the State is unlawful under the Clean Water Act and OAC 252:606-1-3(b)(3)(L) where the discharge is not authorized by an OPDES permit. I also understand that the submittal of this Notice of Termination does not release me as an owner or operator from liability for any violations of this permit or the Clean Water Act.

Print Name: _____ Date: _____

Signature: _____ Title _____

Instructions for Completing Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity

When To File an NOT Form:

Permittees who are presently covered under an issued NPDES or OPDES general permit for storm water discharges associated with industrial/construction activity may submit a **Notice of Termination** (NOT) form when their facilities no longer have any storm water discharges associated with industrial/construction activity as defined in the storm water regulations at 40 CFR 122.26(b)(14), or when they are no longer the operator of the facilities. For a construction site, when the site has been finally stabilized (i.e., a uniform perennial vegetative cover with a density of at least 70% of the native background cover has been established for all unpaved areas and areas not covered by permanent structures or where equivalent permanent stabilization measures such as riprap or gabions have been used), and all storm water discharges from construction activities that are authorized by general permit (OKR10) are eliminated, or they are no longer the operator of the facility, an NOT must be submitted that is signed in accordance with Part 4.5 of the general permit. If you need assistance or have questions, contact the Storm Water Unit of the Environmental Complaints and Local Services at (405) 702-6100.

Section I: Permit Information:

Enter the existing OPDES General Storm Water Permit number assigned to the facility or site identified in Section I.

Section II: Facility Operator Information:

Give the legal name of the person, firm, public organization or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity that controls the facility's operation, rather than the plant or site manager.

Section III: Facility/Site Location Information:

Enter the facility's or site's official or legal name and complete address, including city, state, and ZIP code. If the facility lacks a street address, indicate the latitude and longitude of the facility to the nearest 15 seconds.

Section IV: New Owner/Operator Information

If you are no longer the operator of the facility/site, provide the information pertaining to the new operator at the facility/site, including the name and address of the new owner/operator.

Section V: Certification

The NOT form must be signed by a responsible party as follows:

For a Corporation: by a responsible officer, which means: (i) president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manger is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

For a partnership or sole proprietorship: by a general partner or the proprietor.

For a municipality, state, Federal, or other public agency: by either a principal executive officer or ranking elected official.

Where to File an NOT form:

NOTs must be sent to the following address:

DEQ
Environmental Complaints and Local Services
Storm Water Unit
P.O. Box 1677
Oklahoma City, OK 73101-1677

ADDENDUM D - CONTRACTOR CERTIFICATION

(Optional; sample format)

_____

(Name of Owner/Operator)

_____

(Project Name)

Contractors, builders, regular suppliers or others (contractors) involved in construction activity who are not the owner/operator, developer, or general contractor, and have not been issued the Storm Water Construction General Permit (Permit) authorization, execute this Contractor Certification which places the responsibility of complying with and abiding by the intent and purpose of the permit with the contractor for any and all work performed under the authority and direction of the contractor. Furthermore, the contractor assumes responsibility to avoid or eliminate any actual or potential adverse effects upon the environment according to the Storm Water Pollution Prevention Plan (SWP3), during all phases of building, construction, or delivery activity on any and all construction sites under the control and responsibility of the contractor as described in the SWP3.

1. Contractor company name: _____

2. Contractor address: _____

3. Project locations: _____

_____

(For additional addresses, attach list to this form)

4. Contractor must be thoroughly familiar with the original Notice of Intent (NOI) filed by _____

_____ with the Oklahoma Department of Environmental Quality.

(Owner/Operator Name)

Contractor must also be thoroughly familiar with, and adhere to, the Storm Water Pollution Prevention Plan (SWP3) and the Best Management Practices (BMP) on file at the following location; _____

The Contractor is certifying below that they assume all physical responsibility for any and all construction activities performed by the Contractor or under the direction and control of the Contractor, to avoid or eliminate any actual or potential adverse effects upon the environment pertaining to the properties listed in Item 3 above.

Certification

I certify that I understand the terms and conditions of the Oklahoma Pollutant Discharge Elimination System Act (OPDES) General Permit that authorizes storm water discharges associated with construction activity from the construction site identified as part of this certification. I have read and understand the Owner/Operators Notice of Intent and Part 1.3 eligibility requirements for coverage under the general permit for storm water discharges from construction activities, including those requirements published in the modified OPDES General Permit OKR10 of Month Date, 2007, and the SWP3 and BMP described pertaining to the project locations in Item 3 above. I agree that as a contractor, builder, regular supplier, or a support service company, I am responsible for installing and/or maintaining the appropriate pollution prevention measures that I am responsible for according to the agreement I have with the permittee.

I understand that continued coverage under this permit is contingent upon maintaining eligibility as provided for in Part 1.3 of the permit.

Signature: _____ Title: _____

Print Name: _____ Date: _____

ADDENDUM E – INSPECTION REQUEST

DEQ FORM 605-008 September 13, 2007	OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY	**OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY INSPECTION REQUEST FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER AN OPDES GENERAL PERMIT**

All Requested Information Must Be Provided On This Form. See Instructions On The Back Of Form.

I. Permit Information: OPDES

Storm Water General Permit Authorization Number:

_____

Check here if you are no longer the operator of the facility/site: ☐

Check here if the storm water construction or industrial discharge is being terminated: ☐

II. Facility/Site Owner/Operator Information:

Name: _____ Phone:_____

Address:_____

City: _____ County:_____ Zip Code:_____

III. Facility/Site Location:

Name:_____

Address: _____

City: _____ County: _____Zip Code:_____

Latitude: _____Longitude:_____

IV. New Facility/Site Information:

If you are no longer the operator of the facility/site, provide the following information pertaining to the new operator at the facility/site:

Name:_____

Address: _____

City: _____ County: _____ Zip Code:_____

V. Owner/Operator's Signature:

Print Name: _____ Date:_____

Signature:_____ Title:_____

Instructions for Completing an Inspection Request for Storm Water Discharges Associated with Construction Activity

When To File an Inspection Request Form:

Permittees who are presently covered under an issued NPDES or OPDES general permit for storm water discharges associated with construction activity may submit a **Inspection Request** (IR) form when their facilities are getting ready to file a Notice of Termination (NOT). For a construction site, when the site has been finally stabilized (i.e., a uniform perennial vegetative cover with a density of at least 70% of the native background cover has been established for all unpaved areas and areas not covered by permanent structures or where equivalent permanent stabilization measures such as riprap or gabions have been used), and all storm water discharges from construction activities that are authorized by general permit (OKR10) are eliminated, or they are no longer the operator of the facility, an NOT must be submitted that is signed in accordance with Part 4.5 of the general permit. If you submit this IR form to the ODEQ prior to termination of your current permit, the DEQ will conduct an inspection and provide any assistance necessary within 30 days of receipt of this form. Upon completing the inspection, the DEQ will notify you of any needed changes to the site conditions or that the site has met the final stabilization requirements under the permit. This Inspection Request form should not be substituted for an NOT. You must continue to meet the conditions and terms of the permit until you have filed the NOT. If you have questions, contact the Storm Water Unit of the Environmental Complaints and Local Services (405) 702-6100.

Section I: Permit Information:

Enter the existing OPDES General Storm Water Permit number assigned to the facility or site identified in Section I.

Section II: Facility Operator Information:

Give the legal name of the person, firm, public organization or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity that controls the facility's operation, rather than the plant or site manager.

Section III: Facility/Site Location Information:

Enter the facility's or site's official or legal name and complete address, including city, state, and ZIP code. If the facility lacks a street address, indicate the latitude and longitude of the facility to the nearest 15 seconds.

Section IV New Owner/Operator Information

If you are no longer the operator of the facility/site, provide the information pertaining to the new operator at the facility/site, including the name and address of the new owner/operator.

Section V: Certification

The Inspection Request form must be signed by a responsible party as follows:

For a Corporation: by a responsible officer, which means: (i) president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manger is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

For a partnership or sole proprietorship: by a general partner or the proprietor.

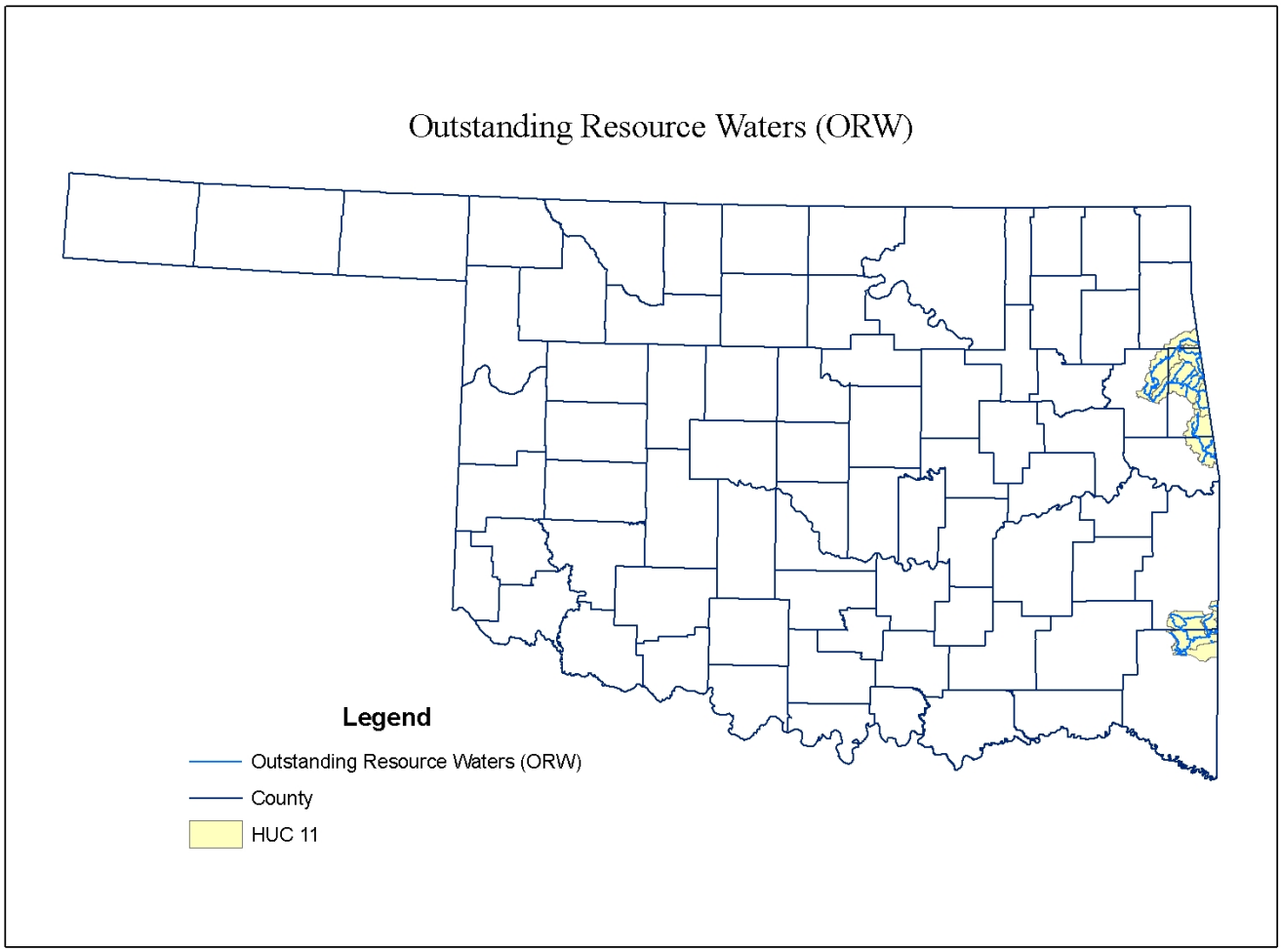
For a municipality, state, Federal, or other public agency: by either principal executive officer or ranking elected official.

Where to File an Inspection Request form:

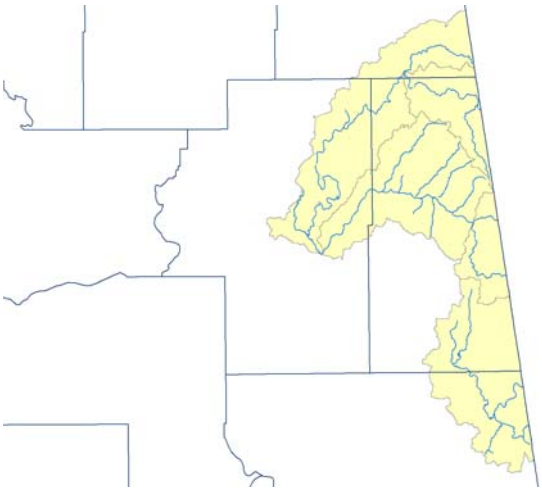
Inspection Requests must be sent to the following address:

DEQ
Environmental Complaints and Local Services
Storm Water Unit
P.O. Box 1677
Oklahoma City, OK 73101-1677

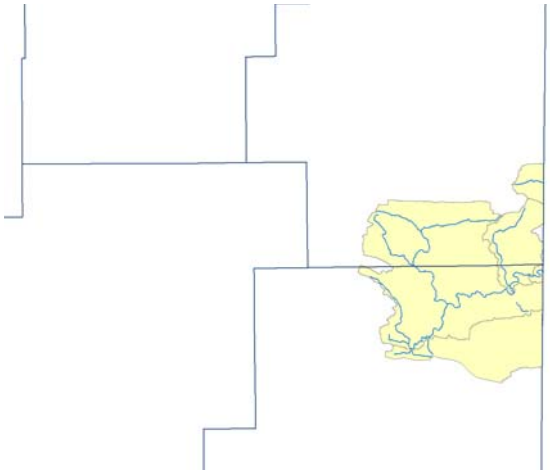
ADDENDUM F – OUTSTANDING RESOURCE WATERS (ORW)



Outstanding Resource Waters Details



Illinois River & Lee Creek Watersheds



Mountain Fork River Watershed

APPENDIX B
Notice of Intent

ADDENDUM B –NOTICE OF INTENT

See Reverse Side for Instructions

DEQ FORM 605-002A September 13, 2007		Oklahoma Department of Environmental Quality Notice of Intent (NOI) for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY on Sites of One Acres or More Acres Under the OPDES General Permit OKR10

SUBMISSION OF THIS NOTICE OF INTENT CONSTITUTES NOTICE THAT THE PARTY IDENTIFIED IN Part I OF THIS FORM INTENDS TO BE AUTHORIZED BY AN OPDES PERMIT ISSUED FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY IN THE STATE OF OKLAHOMA. BECOMING A PERMITTEE OBLIGATES SUCH DISCHARGER TO COMPLY WITH THE TERMS AND CONDITIONS OF THE PERMIT. IN ORDER TO OBTAIN AUTHORIZATION, ALL REQUESTED INFORMATION MUST BE PROVIDED ON THIS FORM. SEE INSTRUCTIONS ON BACK OF FORM.

IF YOUR FACILITY OR SITE IS ON INDIAN COUNTRY LAND, FILE YOUR NOI WITH THE EPA, USING EPA FORM 3510-9.

☐ **NEW APPLICATION** ☐ **MODIFICATION OF CURRENT PERMIT Enter Authorization Number: OKR10_____**

I. Facility Owner/Operator Information

If you are a Co-permittee, check this box ☐

Name: _____ Phone: (_____)_____

Address: _____ Status of Owner/Operator: _____

City: _____ State: _____ Zip Code: _____ E-mail Address: _____

II. Site Information

Name of the project: ADVANCED INDIVIDUAL TRAINING COMPLEX Address: _____

City: _____ County: COMANCHE ZIP Code: _____

Telephone No. (_____)_____ **Location:** Latitude: _____ Longitude: _____

Has a Storm Water Pollution Prevention Plan (SWP3) been developed? X Yes ☐ No

Address of location of SWP3 for viewing: ☐ Address in I. Above. ☐ Address in II. Above. ☐ Other, please specify below.

Address: _____ Phone: (_____)_____

City: _____ Zip Code: _____

Name of Receiving Water Body: _____

Is the Receiving Water Body on the DEQ 303(d) list? ? ☐ Yes ☐ No Is this facility/site on Indian Country land? ☐ Yes ☐ No (See Instructions)

Is there an approved TMDL or watershed plan applicable to this site? ☐ Yes ☐ No

Is this site a part of the common plan of development or sale? ☐ Yes ☐ No Estimated area to be disturbed (to nearest acre): _____

_____/_____/_____ Month Day Year
Construction Start Date

_____/_____/_____ Month Day Year
Estimated Completion Date

Is the Storm Water Pollution Prevention Plan in compliance with all Applicable local sediment and erosion plans?. ☐ Yes ☐ No ☐ None

ENDANGERED SPECIES

Based on the instructions provided in Part 11 and Addendum A of the permit, is the proposed construction or land disturbing activity within the corridor of any of the listed sensitive waters or watersheds?

☐ Yes ☐ No

If the answer is yes, please refer to Part 11.2 Step 2.

All permit eligibility requirements with regard to protection of endangered species through the indicated Section of Part 1.3.2.E.2 of the permit have been complied with. (check one or more boxes):

a. ☐ b. ☐ c. ☐ d. ☐ e. ☐

III. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I understand that continued coverage under this permit is contingent upon maintaining eligibility as provided for in Part 1.3.

Name (Please Print):_____ Date: _____

Signature:_____ Title_____

For DEQ use only: Assigned Authorization Number: OKR10 _____

Instructions – DEQ Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity to be Covered Under the OPDES General Permit OKR10

Who Must File A Notice Of Intent Form

Under the provisions of the Clean Water Act, as amended, (33 U.S. 1251 et.seq.....the Act), Oklahoma Environmental Code, Title 27A of the Oklahoma Statutes, Section 2-14-101 et. seq. and the rules OAC 252:004-15, discharge of storm water from construction activities is prohibited without an Oklahoma Pollutant Discharge Elimination System Permit. The operator of a construction site that has such a storm water discharge must submit an NOI to obtain coverage under an OPDES Storm Water General Permit (OKR10). If you have questions about whether you need a permit under the OPDES Storm Water program, or if you need information, write to the address listed below or telephone the Environmental Complaints and Local Services Division, Department of Environmental Quality (DEQ), at (405) 702-6100 and ask for the Storm Water Unit.

Where to File an NOI Form:

DEQ/Environmental Complaints and Local Services (ECLS)
Storm Water Unit
P.O. Box 1677
Oklahoma City, OK 73101-1677
FAX (405) 702-6223

Note: do not submit an SWP3 with the NOI, unless the project is located (1) within outstanding resource waters, or (2) within Federal and State sensitive waters and watersheds, or (3) within a lager site which is disturbing land of 40 or more acre.

Completing The Form

You must type or print, using upper-case letters, in the appropriate areas only. If you have any questions on this form, call DEQ-ECLS at (405) 702-6100 and ask for the Storm Water Unit.

Section I. Facility Owner/Operator Information
Provide the legal name, mailing address, and telephone number of the person, firm, public organization, or any other entity that either individually or together meet either of the following two criteria: (1) have operational control over the site specifications (including the ability to make modifications in specifications); and (2) have the day-to-day operational control of those activities at the site necessary to ensure compliance with plan requirements and permit conditions. If you are a Co-Permittee, check the appropriate box. Do not use a colloquial name.

Enter the appropriate letter to indicate the legal status of the operator of the facility: F = Federal; S = State; M = Public (other than Federal or State); P = Private.

Section II. Site Information
Enter the Project's official or legal name and complete street address, including city, county, state, ZIP code and phone number. If the site lacks a street address, indicate with a general statement the location of the site (e.g., Intersection of State Highways 61 and 34). The applicant must also provide the latitude and longitude of the facility in degrees, minutes, and seconds to the nearest 15 seconds (45º 7' 24" = 45.1234 decimal latitude) of the approximate center of the site.

The latitude and longitude of your facility can be located on USGS quadrangle maps. The quadrangle maps may be obtained at 1-800-USA MAPS. Longitude and latitude may also be obtained at the Census Bureau Internet site: http://www.census.gov/cgi-bin/gazetteer. Only one location description is needed: address; section, township, and range; or latitude and longitude.

Provide the address and phone number where the SWP3 may be viewed, if different from address previously given. Check appropriate box.

Enter the name of the receiving water body, the closest predominant receiving water body. The Oklahoma 303(d) list can be found online at http://www.deq.state.ok.us/WQDnew/305b_303d/index.html or the DEQ GIS Map and Data Viewer at http://maps.scigis.com/deq_wq/

If your facility or site is on Indian Country land, do not complete this form. File your NOI with the EPA using EPA Form 3510-9.

Indicate whether your discharge will be consistent with the conditions and requirements of EPA approved or established TMDLs. An approved TMDL report can be found online on the DEQ website at http://www.deq.state.ok.us/WQDnew/tmdl/index.html

Indicate whether your site is a part of the common plan of development or sale, which is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.

Enter the estimated area to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest acre.

Enter the construction start and estimated completion date using four digits for the year.

Indicate if the proposed construction site or land disturbing activity is within the corridor of a listed sensitive water or watershed, Addendum A of the General Permit, and associated with the discharges and requirements to be covered by this permit as follows, Part 1.3.2.E.2:

a The proposed construction site or land disturbing activity is not located within any of the corridors of the Federal or State identified sensitive waters or watersheds, and further investigation is not required.

b The proposed construction site or land disturbing activity is located within a corridor of a Federally or State identified sensitive water or watershed (Addendum A). The SWP3 describes this area in relation to the listed water or watershed and specifies the measures to be employed to protect the endangered or threatened species or their critical habitat.

c If applicant's storm water discharges and storm water discharge-related activities meet the criteria under Part 1.3.2.E.2.a, b, d, or e, there is no need to contact the U.S. Fish and Wildlife Service (USFWS) for Federal sensitive waters and watersheds or the Oklahoma Department of Wildlife Conservation (ODWC) for State sensitive waters (see Part 11). If one of those eligibility criteria cannot be met, applicants may contact those agencies for either a no jeopardy opinion or a finding that the storm water discharges are not likely to adversely affect listed species or critical habitat; or

d The applicant's construction activities are authorized by the appropriate Federal or State agency and that authorization addresses the incidental taking of listed species by the applicant's storm water discharge or storm water discharge-related activities; or

e The applicant's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Part 1.3.2.E.2 a, b, c, or d that included the applicant's project area. By certifying eligibility under Part 1.3.2.E.2 f, the applicant agrees to comply with applicable measures or controls upon which the other operator's certification under Part 1.3.2.E.2 a, b, c or d was based.

Indicate if the SWP3 is in compliance with all other applicable local sediment and erosion plans.

Section III. Certification
Federal Statutes provide for severe penalties for submitting false information on this application form. Federal regulations require this application to be signed as follows:
For a corporation: by a responsible corporate officer, which means: (i) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manger is authorized to make management decisions which govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign had been assigned or delegated to the manager in accordance with corporate procedures.
For a partnership or sole proprietorship: by a general partner of the proprietor, or; For a municipality, state, Federal, or other public agency: by either a principal executive or ranking elected official.

APPENDIX C
NOT Form

ADDENDUM C – NOTICE OF TERMINATION

DEQ FORM 605-003 September 13, 2007		OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY NOTICE OF TERMINATION (NOT) FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL OR CONSTRUCTION ACTIVITY UNDER AN OPDES GENERAL PERMIT

Submission of this Notice of Termination constitutes notice that the party identified in Section I of this form is no longer authorized to discharge storm water associated with industrial or construction activities under the OPDES program.

All Requested Information Must Be Provided On This Form. See Instructions On The Back Of Form.

I. Permit Information: OPDES Storm Water General Permit Authorization Number: _____

Check here if you are no longer the operator of the facility/site: ☐

Check here if the storm water construction or industrial discharge is being terminated: ☐

II. Facility/Site Owner/Operator Information:

Name: _____ Phone: _____

Address: _____

City: _____ County: _____ Zip Code: _____

III. Facility/Site Location:

Name: _____

Address: _____

City: _____ County: _____ Zip Code: _____

Latitude: _____ Longitude: _____

IV. New Facility/Site Information:

If you are no longer the operator of the facility/site, provide the following information pertaining to the new operator at the facility/site:

Name: _____

Address: _____

City: _____ County: _____ Zip Code: _____

V. Certification:

I certify under penalty of law that all storm water discharges associated with industrial/construction activity from the identified facility/site that were authorized by a general permit have been eliminated or that I am no longer the owner or operator of the facility/site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge storm water associated with industrial or construction activity under this general permit, and that discharging pollutants in storm water associated with industrial or construction activity to waters of the State is unlawful under the Clean Water Act and OAC 252:606-1-3(b)(3)(L) where the discharge is not authorized by an OPDES permit. I also understand that the submittal of this Notice of Termination does not release me as an owner or operator from liability for any violations of this permit or the Clean Water Act.

Print Name: _____ Date: _____

Signature: _____ Title _____

Instructions for Completing Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity

When To File an NOT Form:

Permittees who are presently covered under an issued NPDES or OPDES general permit for storm water discharges associated with industrial/construction activity may submit a **Notice of Termination** (NOT) form when their facilities no longer have any storm water discharges associated with industrial/construction activity as defined in the storm water regulations at 40 CFR 122.26(b)(14), or when they are no longer the operator of the facilities. For a construction site, when the site has been finally stabilized (i.e., a uniform perennial vegetative cover with a density of at least 70% of the native background cover has been established for all unpaved areas and areas not covered by permanent structures or where equivalent permanent stabilization measures such as riprap or gabions have been used), and all storm water discharges from construction activities that are authorized by general permit (OKR10) are eliminated, or they are no longer the operator of the facility, an NOT must be submitted that is signed in accordance with Part 4.5 of the general permit. If you need assistance or have questions, contact the Storm Water Unit of the Environmental Complaints and Local Services at (405) 702-6100.

Section I: Permit Information:

Enter the existing OPDES General Storm Water Permit number assigned to the facility or site identified in Section I.

Section II: Facility Operator Information:

Give the legal name of the person, firm, public organization or any other entity that operates the facility or site described in this application. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity that controls the facility's operation, rather than the plant or site manager.

Section III: Facility/Site Location Information:

Enter the facility's or site's official or legal name and complete address, including city, state, and ZIP code. If the facility lacks a street address, indicate the latitude and longitude of the facility to the nearest 15 seconds.

Section IV: New Owner/Operator Information

If you are no longer the operator of the facility/site, provide the information pertaining to the new operator at the facility/site, including the name and address of the new owner/operator.

Section V: Certification

The NOT form must be signed by a responsible party as follows:

For a Corporation: by a responsible officer, which means: (i) president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; or their designee, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manger is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

For a partnership or sole proprietorship: by a general partner or the proprietor.

For a municipality, state, Federal, or other public agency: by either a principal executive officer or ranking elected official.

Where to File an NOT form:

NOTs must be sent to the following address:

DEQ
Environmental Complaints and Local Services
Storm Water Unit
P.O. Box 1677
Oklahoma City, OK 73101-1677

APPENDIX D
Site Notice

Advanced Individual Training Complex Project

CONSTRUCTION SITE NOTICE

For Storm Water Discharges Associated with Construction Activity
Authorized by Oklahoma Department Environmental Quality General Permit
Under the Oklahoma Pollutant Discharge Elimination System

Permittee:	XXXX Client Name
Project Name:	Advanced Individual Training Complex
Issued General Permit No.:	
Facility Contact Name:	Mr./Ms. Doe (XXX) XXX-XXXX
Project Description:	The Project consists of the site planning and design for the Advanced Individual Training (AIT) complex located at Ft. Sill Army Post, Oklahoma. The complex includes five new Barracks & Company Operations Facilities buildings, a Battalion Headquarters building, an athletic running track, and a dining facility with the ability to allow for the possible future expansion of two more builidings. The project area is located between Fort Sill Boulevard and McKee Street on the east and west and Thomas Street and Mow-way Road on the north and south. The Project consists of 159 acres, 93 of which will be disturbed. The Project is scheduled to begin in March 2011 and be completed by June 2012.

APPENDIX E
Inspections

Advanced Individual Training Complex Project
Storm Water Pollution Prevention Plan

INSPECTION AND MAINTENANCE REPORT FORM

(Permit No. OKR10)

Name of Permittee: ____XXXXClient_____

Construction Site Name: Advanced Individual Training Complex Project

Inspector: _____Date: _____Time: _____

Present Phase of Construction: _____

Site Conditions: _____

Inspection Event:

☐ ROUTINE BI-WEEKLY
☐ RAIN EVENT RAINFALL (record all events > 0.5 inches): inches
☐ OTHER EXPLANATION: _____

Measures & Controls	Location	In Conformance with Typical Standard	Effective Pollutant Control Practice
Silt Fence/Straw Bales		☐ YES ☐ NO	☐ YES ☐ NO
Storm Drain Inlet Protection		☐ YES ☐ NO	☐ YES ☐ NO
Construction Site Entrances/Exits		☐ YES ☐ NO	☐ YES ☐ NO
		☐ YES ☐ NO	☐ YES ☐ NO
		☐ YES ☐ NO	☐ YES ☐ NO
Stabilization Measures		☐ YES ☐ NO	☐ YES ☐ NO

NON-CONFORMANCE/INEFFECTIVE POLLUTANT CONTROL PRACTICES NOTED DURING INSPECTION: (Explain each "NO" circled above)

RECOMMENDED REMEDIAL ACTIONS AND SCHEDULE OF THOSE EVENTS:

ADDITIONAL COMMENTS:

Signature:_____ Printed Name: _____
Environmental Inspector

Advanced Individual Training Complex Project
Storm Water Pollution Prevention Plan

RECORD OF REVISIONS

Name of Permittee: XXXXClient

Construction Site Name: Advanced Individual Training Complex Project

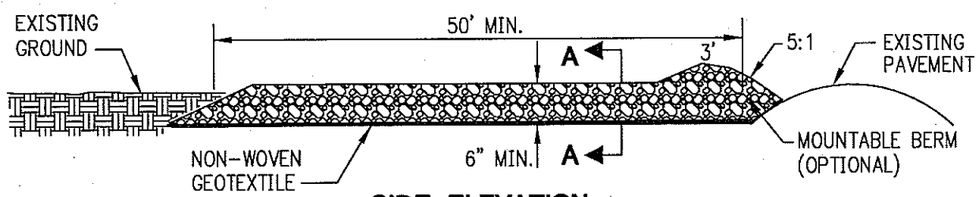
Inspector: _____ Date: _____

Date	Sections Modified	Description of Modification	Approval Signatures

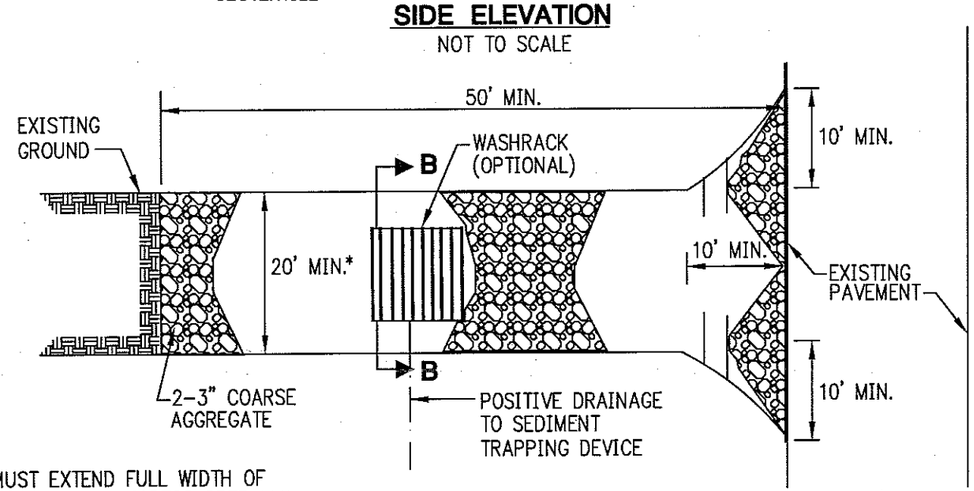
APPENDIX F
Erosion Plans

APPENDIX G
BMP Details

TEMPORARY CONSTRUCTION ENTRANCE

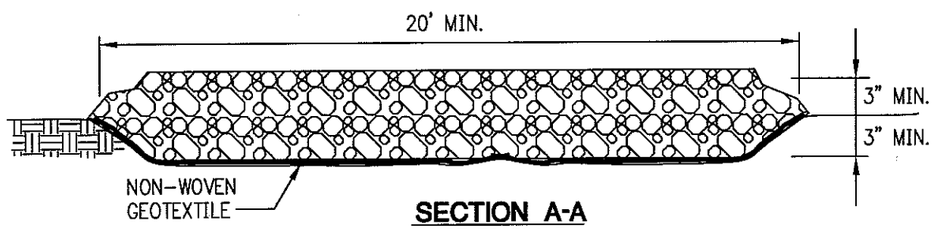


SIDE ELEVATION
NOT TO SCALE

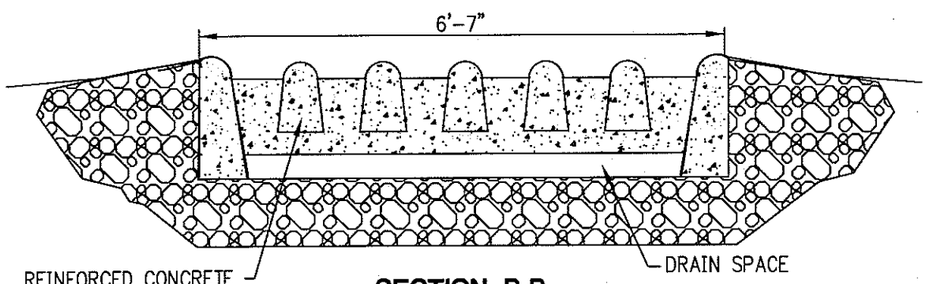


* MUST EXTEND FULL WIDTH OF INGRESS AND EGRESS OPERATION

PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE

SOURCE: MODIFIED FROM VA. DCR, 1992

TEMPORARY CONSTRCUTION ENTRANCE PAD NOTES:

A) INSTALLATION:

1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS. IF POSSIBLE, LOCATE WHERE PERMANENT ROADS WILL EVENTUALLY BE CONSTRUCTED.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. IF SLOPE TOWARDS THE PUBLIC ROAD EXCEEDS 2%, CONSTRUCT A 6-TO 8-INCH HIGH RIDGE WITH 3H:1V SIDE SLOPES ACROSS THE FOUNDATION APPROXIMATELY 15 FEET FROM THE EDGE OF THE PUBLIC ROAD TO DIVERT RUNOFF AWAY FROM IT.
4. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES ALONG PUBLIC ROADS.
5. PLACE STONE TO DIMENSIONS AND GRADE AS SHOWN ON PLANS. LEAVE SURFACE SMOOTH AND SLOPED FOR DRAINAGE.
6. DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE.
7. IF WET CONDITIONS ARE ANTICIPATED, PLACE GEOTEXTILE FABRIC ON THE GRADED FOUNDATION TO IMPROVE STABILITY.

B) TROUBLESHOOTING:

1. CONSULT WITH A QUALIFIED DESIGN PROFESSIONAL IF ANY OF THE FOLLOWING OCCUR:
   a. INADEQUATE RUNOFF CONTROL TO THE EXTENT THAT SEDIMENT WASHES ONTO PUBLIC ROAD – INSTALL DIVERSIONS OR OTHER RUNOFF CONTROL MEASURES.
   b. SMALL STONE, THIN PAD, OR ABSENCE OF GEOTEXTILE FABRIC RESULTS IN RUTS AND MUDDY CONDITIONS AS STONE IS PRESSED INTO SOIL – INCREASE STONE SIZE OR PAD THICKNESS OR ADD GEOTEXTILE FABRIC.
   c. PAD TOO SHORT FOR HEAVY CONSTRUCTION TRAFFIC – EXTEND PAD BEYOND THE MINIMUM 50-FOOT LENGTH AS NECESSARY.

C) INSPECTION AND MAINTENANCE:

1. INSPECT STONE PAD AND SEDIMENT DISPOSAL AREA WEEKLY AND AFTER 1/2-INCH OR GREATER STORM EVENTS.
2. RESHAPE PAD AS NEEDED FOR PROPER DRAINAGE AND RUNOFF CONTROL.
3. TOPDRESS WITH CLEAN 2-AND 3-INCH STONE AS NEEDED.
4. IMMEDIATELY REMOVE MUD OR SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROAD. REPAIR ANY BROKEN ROAD PAVEMENT IMMEDIATELY.
5. REMOVE ALL TEMPORARY ROAD MATERIALS FROM AREAS WHERE PERMANENT VEGETATION WILL BE ESTABLISHED.

AMERICAN PUBLIC WORKS ASSOCIATION		
APWA	KANSAS CITY METROPOLITAN CHAPTER	
TEMPORARY CONSTRUCTION ENTRANCE	STANDARD DRAWING NUMBER ESC-01	
	ADOPTED:	

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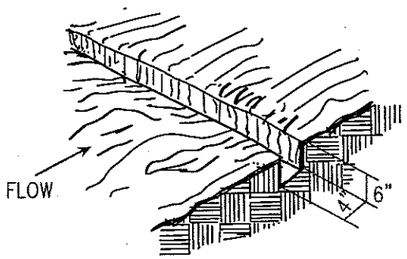
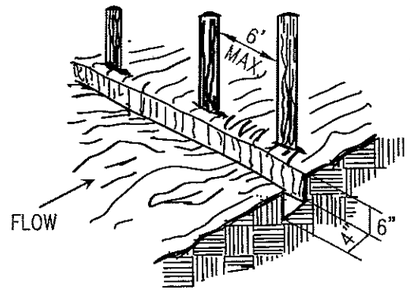
SEDIMENT FENCE

1. EXCAVATE A 6"x4" TRENCH.

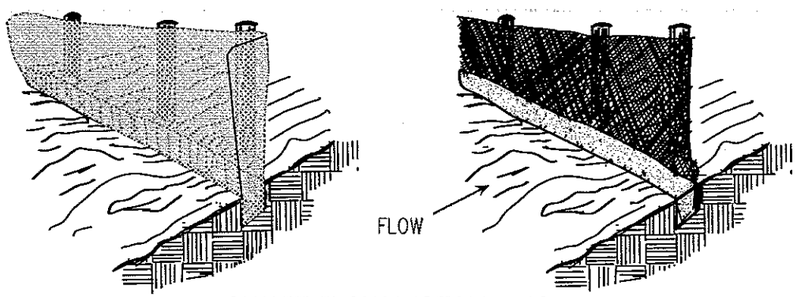


2. SET THE STAKES ALONG THE DOWN SLOPE SIDE OF THE TRENCH.

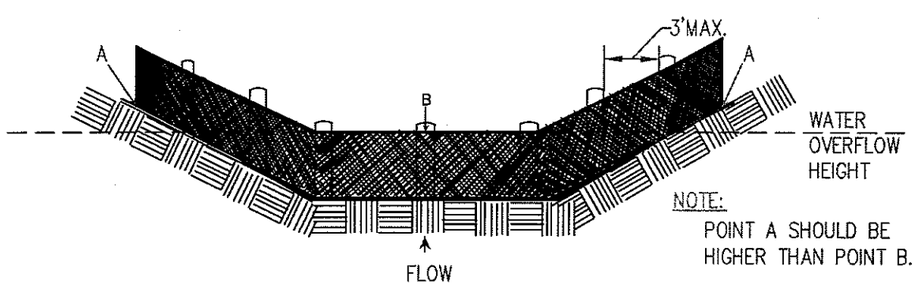


3. STAPLE GEOTEXTILE MATERIAL TO STAKES AND EXTEND IT INTO AND AROUND THE BOTTOM OF THE TRENCH.

4. BACKFILL AND COMPACT THE EXCAVATED SOIL OVER THE GEOTEXTILE IN THE TRENCH.



SHEET FLOW INSTALLATION
(PERSPECTIVE VIEW)
NOT TO SCALE



NOTE:
POINT A SHOULD BE HIGHER THAN POINT B.

DRAINAGEWAY INSTALLATION
(FRONT ELEVATION)
NOT TO SCALE

SEDIMENT FENCE NOTES:

A) INSTALLATION:

1. THE HEIGHT OF SEDIMENT FENCE SHALL BE A MINIMUM OF 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE AND SHALL NOT EXCEED 34 INCHES ABOVE THE GROUND SURFACE.
2. THE FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE UNAVOIDABLE, FILTER CLOTH SHALL BE SECURELY SPLICED TOGETHER ONLY AT SUPPORT POSTS, WITH A MAX 6-INCH OVERLAP.
3. DIG A TRENCH AT LEAST 6 INCHES DEEP AND 4 INCHES WIDE ALONG THE FENCE ALIGNMENT.
4. DRIVE POSTS AT LEAST 24 INCHES INTO THE GROUND ON THE DOWNSLOPE SIDE OF THE TRENCH. SPACE POSTS A MAXIMUM OF 6 FEET APART.
5. EXTRA-STRENGTH SEDIMENT FENCE FABRIC SHALL BE USED. POSTS FOR THIS TYPE OF FABRIC SHALL BE PLACED A MAXIMUM OF 6 FEET APART. THE SEDIMENT FABRIC SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING A MINIMUM OF ONE INCH LONG, HEAVY-DUTY WIRE STAPLES OR TIE-WIRES, AND EIGHT INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. PLACE THE BOTTOM 1 FOOT OF FABRIC IN THE MINIMUM-OF-6-INCH DEEP TRENCH, LAPPING TOWARD THE UPSLOPE SIDE. BACKFILL WITH COMPACTED EARTH OR GRAVEL.
7. IF A SEDIMENT FENCE IS TO BE CONSTRUCTED ACROSS A DITCH LINE OR SWALE, IT MUST BE OF SUFFICIENT LENGTH TO ELIMINATE ENDFLOW, AND THE PLAN CONFIGURATION SHALL RESEMBLE AN ARC OR HORSESHOE, PLACED ON A CONTOUR, WITH THE ENDS ORIENTED UPSLOPE. EXTRA-STRENGTH SEDIMENT FABRIC SHALL BE USED WITH A MAXIMUM 3-FOOT SPACING OF POSTS.
8. TO REDUCE MAINTENANCE, EXCAVATE A SHALLOW SEDIMENT STORAGE AREA IN THE UPSLOPE SIDE OF THE FENCE. PROVIDE GOOD ACCESS IN AREAS OF HEAVY SEDIMENTATION FOR CLEAN OUT AND MAINTENANCE.
9. SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.

B) TROUBLESHOOTING:

1. DETERMINE THE EXACT LOCATION OF UNDERGROUND UTILITIES, BEFORE FENCE INSTALLATION SO UTILITIES ARE NOT DISTURBED.
2. GRADE ALIGNMENT OF FENCE AS NEEDED TO PROVIDE A BROAD, NEARLY LEVEL AREA UPSTREAM OF FENCE TO ALLOW SEDIMENT COLLECTION AREA.

C) INSPECTION MAINTENANCE:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. AVOID DAMAGING OR UNDERMINING THE FENCE DURING CLEANOUT. SEDIMENT ACCUMULATION SHOULD NOT EXCEED 1/2 THE HEIGHT OF THE FENCE.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY AND COMPLETELY STABILIZED.

SOURCE: MODIFIED FROM VA. DCR, 1992

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
KANSAS CITY METROPOLITAN CHAPTER
SEDIMENT FENCE
STANDARD DRAWING NUMBER ESC-10
ADOPTED:

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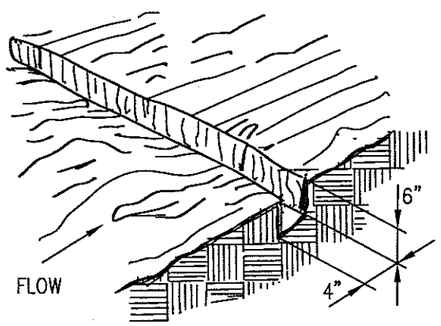
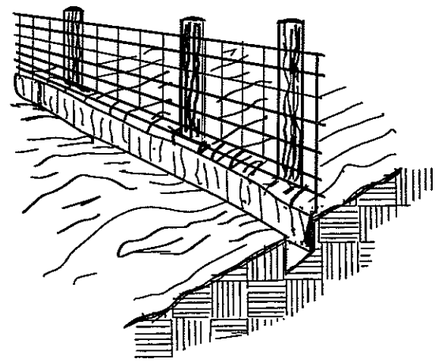
SUPER SEDIMENT FENCE

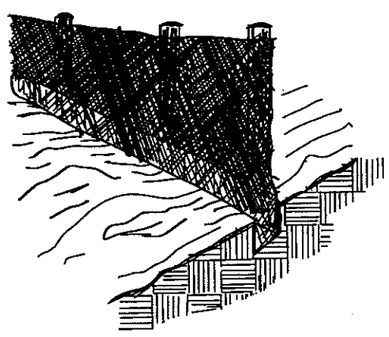
1. EXCAVATE A 6"X4" TRENCH



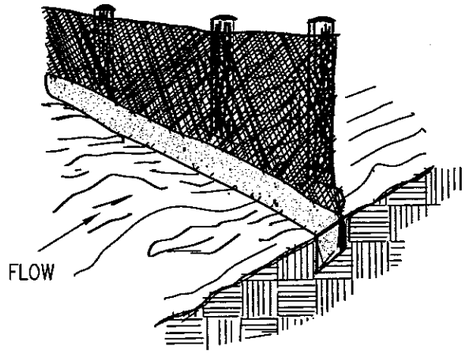
2. SET THE METAL T-POSTS OR FENCE POSTS ON THE DOWNSLOPE SIDE OF THE TRENCH. SECURE WIRE FENCING TO THE POSTS.



3. ATTACH THE GEOTEXTILE FABRIC TO THE WIRE FENCE AND EXTEND IT INTO AND AROUND THE BOTTOM OF THE TRENCH.

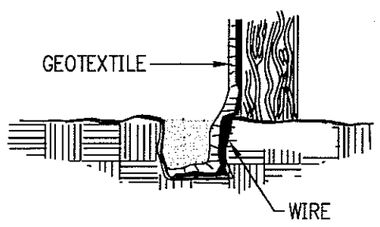


4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC AND WIRE INTO THE TRENCH

NOT TO SCALE



SECTIONAL FENCE ANCHOR DETAIL

SOURCE: MODIFIED FROM VA. DCR, 1992

SUPER SEDIMENT FENCE NOTES:

A) CONSTRUCTION SPECIFICATIONS:

1. FENCING SHALL BE 42-INCHES IN HEIGHT.
2. WIRE FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES AND STAPLES. THE LOWER TENSION WIRE, BRACE AND TRUSS RODS, DRIVE ANCHORS, AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
3. SEDIMENT FENCE SHALL BE FASTENED SECURELY TO THE WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP AND MID-SECTION.
4. SEDIMENT FENCE AND WIRE SHALL BE EMBEDDED A MINIMUM OF 8-INCHES INTO THE GROUND.
5. WHEN TWO SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6-INCHES AND FOLDED.
6. WIRE FENCE WILL BE BETWEEN 9 AND 14 GAUGE AND SHALL HAVE A MAXIMUM MESH SPACING OF 6-INCHES.
7. SEDIMENT FENCE SHALL MEET THE FOLLOWING REQUIREMENTS FOR GEOTEXTILE CLASS F: ADDITIONAL SPECIFICATIONS ARE FOUND IN ASTM 6461.

SEDIMENT FENCE REQUIREMENTS

TENSION STRENGTH	50 LB/IN OR MORE	ASTM 4632
TENSION MODULUS	20 LB/IN OR MORE	ASTM 4632
FLOW RATE	0.3 GAL/FT^2/MINUTE OR LESS	ASTM 5141
FILTERING EFFICIENCY	75 % OR MORE	ASTM 5141

B) INSTALLATION:

1. THE HEIGHT OF A SEDIMENT FENCE SHALL BE A MINIMUM OF 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE AND SHALL NOT EXCEED 34-INCHES ABOVE GROUND SURFACE.
2. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE UNAVOIDABLE, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP, AND SECURELY
3. SEALED.
   A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4 INCHES WIDE AND 6 INCHES DEEP ON THE UPSLOPE
4. SIDE OF THE PROPOSED LOCATION OF THE FENCE.
   WHEN WIRE SUPPORT IS USED, STANDARD-STRENGTH FILTER CLOTH MAY BE USED. POSTS FOR THIS TYPE OF INSTALLATION SHALL BE PLACED A MAXIMUM OF 10 FEET APART. THE WIRE MESH FENCE MUST BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 34 INCHES ABOVE THE ORIGINAL GROUND SURFACE. THE STANDARD-STRENGTH FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 8 INCHES OF THE FABRIC
5. SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
   IF A SEDIMENT FENCE IS TO BE CONSTRUCTED ACROSS A DITCH LINE OR SWALE, IT MUST BE OF SUFFICIENT LENGTH TO ELIMINATE ENDFLOW, AND THE PLAN CONFIGURATION SHALL RESEMBLE AN ARC OR HORSESHOE WITH THE ENDS ORIENTED UPSLOPE. EXTRA-STRENGTH FILTER FABRIC SHALL BE USED FOR
6. THIS APPLICATION WITH A MAXIMUM 3-FOOT SPACING OF POSTS.
   THE 4 INCH BY 6 INCH TRENCH SHALL BE BACKFIELD AND THE SOIL COMPACTED OVER THE FILTER
7. FABRIC.
   SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED. SEDIMENT ACCUMULATION SHOULD NOT EXCEED 1/2 THE HEIGHT OF THE FENCE.

C) INSPECTION AND MAINTENANCE:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. MAINTENACE SHALL BE PERFORMED AS NEEDED AND SEDIMENT BUILD-UPS REMOVED WHEN BULGES DEVELOP IN THE SEDIMENT FENCE OR WHEN SEDIMENT REACHES 50% OF THE FENCE HEIGHT. AVOID DAMAGING OR UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
SUPER SEDIMENT FENCE	STANDARD DRAWING NUMBER ESC-12 ADOPTED:

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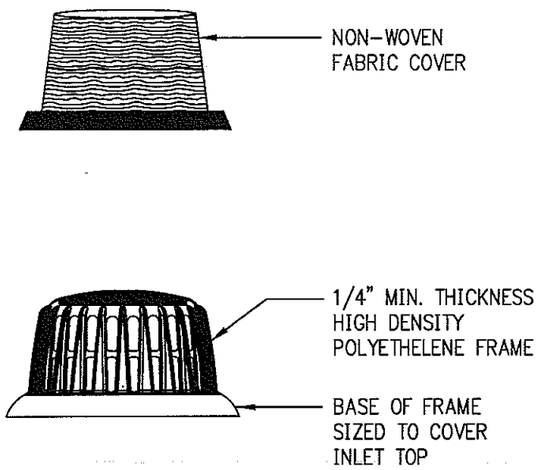
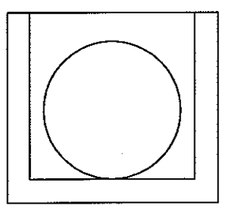
SILT SAVER





SIDE VIEW

TYPICAL SILT SAVER® COVER
NOT TO SCALE

SILT SAVER® NOTES:

A) CONSTRUCTION SEQUENCE FOR SILT SAVER®:

1. EXCAVATE APPROXIMATELY 4" TO 6" BELOW THE TOP OF THE INLET STRUCTURE.
2. PLACE THE FRAME ONTO THE INLET STRUCTURE; ENSURE THE FRAME COVERS THE STRUCTURE COMPLETLY.
3. PLACE THE FABRIC OVER THE FRAME.
4. FILL THE POCKETS WITH SOIL, #57 GRAVEL, OR EQUIVALENT; THE POCKETS SHOULD BE COMPLETELY FILLED TO ENSURE A GOOD SEAL BETWEEN THE GROUND AND THE INLET STRUCTURE.
5. BACKFILL AROUND THE FRAME AND FABRIC ASSEMBLY IS NOT REQUIRED TO COMPLETE INSTALLATION; HOWEVER BACKFILLING MAY BE NECESSARY TO COMPLETE EXCAVATION REQUIREMENTS FOR THE SITE.

B) MAINTENANCE REQUIREMENTS FOR SILT SAVER® FRAME AND FABRIC:

1. MAINTENANCE IS REQUIRED WHEN ERODED SOILS REACH A POINT OF 65% OF THE TOTAL HEIGHT OF THE FRAME OR APPROXIMATELY 7 TO 9 INCHES OF THE GREY FABRIC MATERIAL IS SHOWING.
2. REMOVE THE IMPACTED MATERIAL BY HAND OR MACHINE. DO NOT DAMAGE THE FRAME OR FABRIC.
3. BRUSH, SWEEP, OR WASH FABRIC AND INSPECT FOR ANY CUTS OR ABRASIONS; REPLACE FABRIC AS NECESSARY.
4. INSPECT FRAME FOR ANY STRESS OR DAMAGE, AND REPLACE AS NESCESSARY.
5. REFILL FABRIC POCKETS AND BACKFILL AS REQUIRED BY JOBSITE CONDITIONS.

SOURCE: WWW.SILTSAVER.COM

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
SILT SAVER®	STANDARD DRAWING NUMBER ESC-18 ADOPTED:

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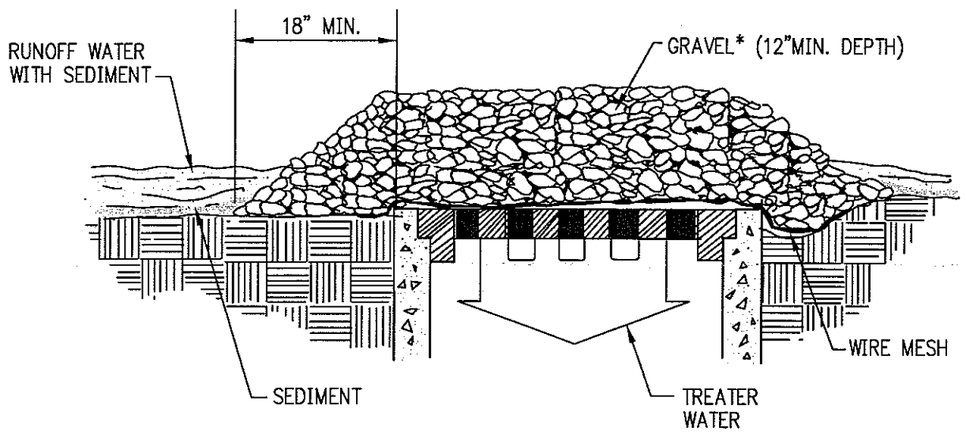
GRAVEL AND WIRE MESH DROP INLET SEDIMENT TRAP



NOTE:
* USE CLEAN GRAVEL, 1/2" DIAMETER.

GRAVEL AND WIRE MESH DROP INLET SEDIMENT TRAP NOTES:

A) GENERAL NOTES:

1. WIRE MESH SHALL BE LAID OVER THE DROP INLET SO THAT THE WIRE EXTENDS A MINIMUM OF 1 FOOT BEYOND EACH SIDE OF THE INLET STRUCTURE. WIRE MESH WITH 1/2-INCH OPENINGS SHALL BE USED. IF MORE THAN ONE STRIP OF MESH IS NECESSARY, THE STRIPS SHALL BE OVERLAPPED.
2. COARSE AGGREGATE SHALL BE PLACED OVER THE WIRE MESH. THE DEPTH OF STONE SHALL BE AT LEAST 12-INCHES OVER THE ENTIRE INLET OPENING. THE STONE SHALL EXTEND BEYOND THE INLET OPENING AT LEAST 18-INCHES ON ALL SIDES.
3. IF THE STONE BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PERFORMS ITS FUNCTION, THE STONES MUST BE PULLED AWAY FROM THE INLET AND CLEANED OR REPLACED.

B) INSPECTION AND MAINTENANCE:

1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN EVENT OF 1/2 INCH OR GREATER AND REPAIRS MADE AS NEEDED.
2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
3. STRUCTURES SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

SOURCE: MODIFIED FROM VA. DCR, 1992

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
GRAVEL AND WIRE MESH DROP INLET SEDIMENT TRAP	STANDARD DRAWING NUMBER ESC-20 ADOPTED:

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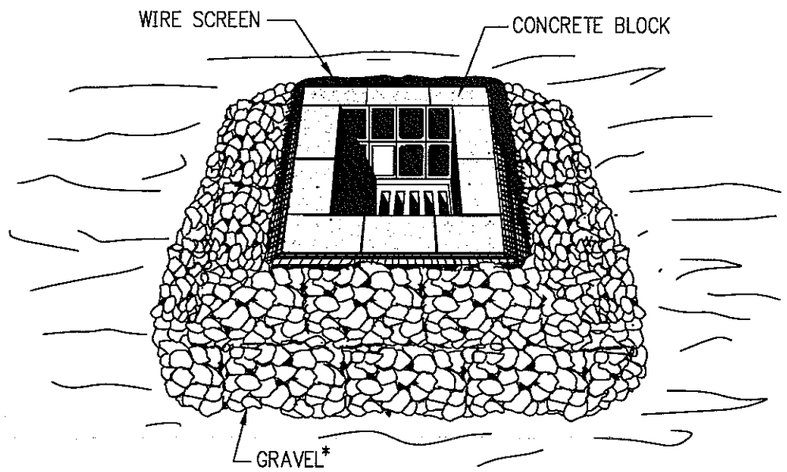
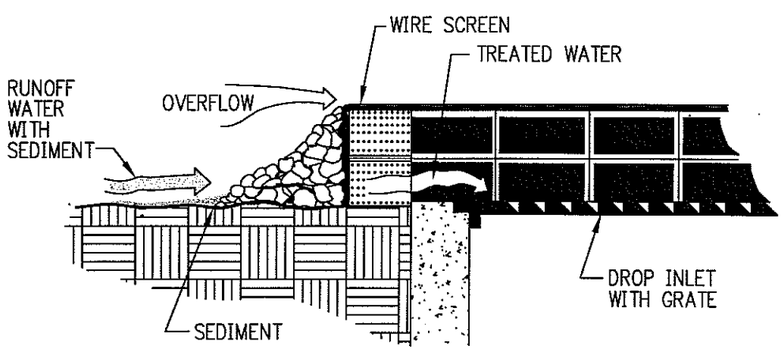
BLOCK AND GRAVEL DROP INLET SEDIMENT TRAP



NOTE:
* USE CLEAN GRAVEL, 1/2" TO 1" DIAMETER



CROSS SECTION

BLOCK AND GRAVEL DROP INLET SEDIMENT TRAP NOTES:

A) GENERAL NOTES:

1. PLACE CONCRETE BLOCKS LENGTHWISE ON THEIR SIDES IN A SINGLE ROW AROUND THE PERIMETER OF THE INLET WITH THE ENDS OF THE ADJACENT BLOCKS ABUTTING. THE HEIGHT OF THE BARRIER CAN BE VARIED, DEPENDING ON THE DESIGN NEEDS, BY STACKING COMBINATIONS OF 4-INCH, 8-INCH, AND 12-INCH BLOCKS. THE BARRIER OF BLOCKS SHALL BE AT LEAST 12 INCHES HIGH AND NO GREATER THAN 24 INCHES HIGH.

2. WIRE MESH, OR WEBBING, SHALL BE PLACED OVER THE OUTSIDE VERTICAL FACE OF THE CONCRETE BLOCKS TO PREVENT STONE FROM BEING WASHED THROUGH THE HOLES IN THE BLOCKS. WIRE MESH WITH 1/2-INCH OPENINGS SHALL BE USED.

3. STONE SHALL BE PILED AGAINST THE WIRE TO THE TOP OF THE BLOCK BARRIER.

4. IF THE STONE BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PERFORMS ITS FUNCTION, THE STONE MUST BE PULLED AWAY FROM THE BLOCKS AND CLEANED OR REPLACED.

B) INSPECTION AND MAINTENANCE:

1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN EVENT OF 1/2 INCH OR GREATER AND REPAIRS MADE AS NEEDED.

2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA SO THAT IT WILL NOT ERODE.

3. STRUCTURES SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

SOURCE: MODIFIED FROM VA. DCR, 1992

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
BLOCK AND GRAVEL DROP INLET SEDIMENT TRAP	STANDARD DRAWING NUMBER ESC-21 ADOPTED:

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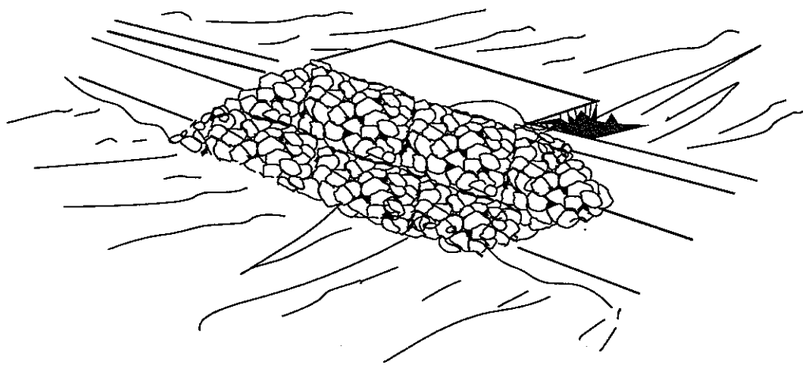
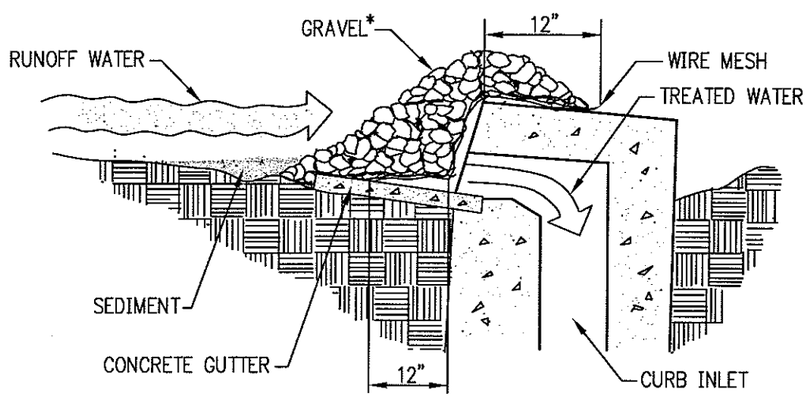
GRAVEL CURB INLET SEDIMENT TRAP





CROSS SECTION
NOT TO SCALE

NOTE:

*USE CLEAN GRAVEL 1/2" TO 1" IN DIAMETER.

GRAVEL CURB INLET SEDIMENT TRAP NOTES:

A) GENERAL NOTES:

1. WIRE MESH WITH 1/2-INCH OPENINGS SHALL BE PLACED OVER THE CURB INLET OPENING SO THAT AT LEAST 12 INCHES OF WIRE EXTENDS ACROSS THE INLET COVER AND AT LEAST 12 INCHES OF WIRE EXTENDS ACROSS THE CONCRETE GUTTER FROM THE INLET OPENING.
2. STONE SHALL BE PILED AGAINST THE WIRE SO AS TO ANCHOR IT AGAINST THE GUTTER AND INLET COVER AND TO COVER THE INLET OPENING COMPLETELY.
3. IF THE STONE BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PERFORMS ITS FUNCTION, THE STONE MUST BE PULLED AWAY FROM THE BLOCK AND CLEANED OR REPLACED.

B) INSPECTION AND MAINTENANCE:

1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN EVENT OF 1/2-INCH OR GREATER AND REPAIRS MADE AS NEEDED.
2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA SO THAT IT WILL NOT ERODE.
3. STRUCTURES SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

SOURCE: MODIFIED FROM VA. DCR, 1992

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
GRAVEL CURB INLET SEDIMENT TRAP	STANDARD DRAWING NUMBER ESC-24 ADOPTED:

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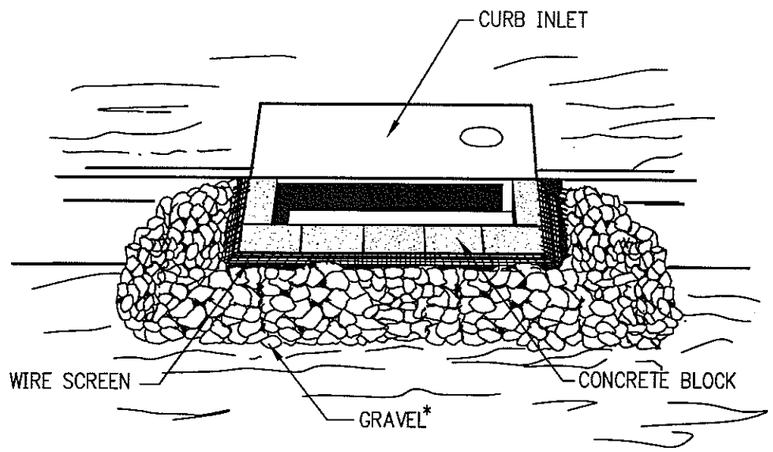
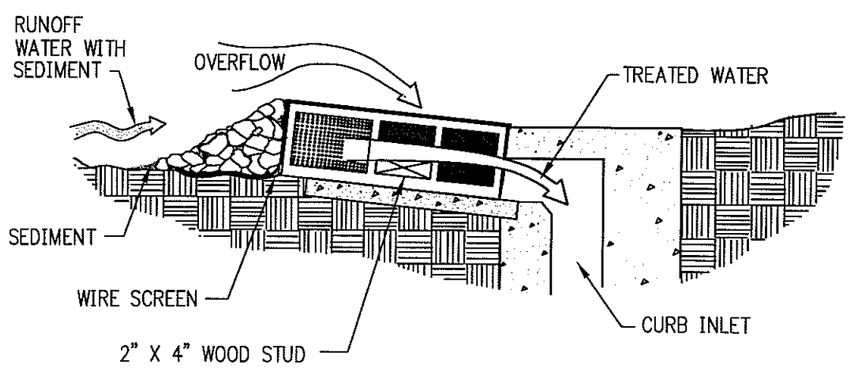
BLOCK AND GRAVEL CURB INLET PROTECTION



* GRAVEL SHALL BE COARSE AGGREGATE FROM 1/2" TO 1" IN DIAMETER



CROSS SECTION
NOT TO SCALE

BLOCK AND GRAVEL CURB INLET PROTECTION NOTES:

A) GENERAL NOTES:

1. TWO CONCRETE BLOCKS SHALL BE PLACED ON THEIR SIDES ABUTTING THE CURB AT EITHER SIDE OF THE INLET OPENING.
2. A 2 X 4 STUD SHALL BE CUT AND PLACED THROUGH THE OUTER HOLES OF EACH SPACER BLOCK TO HELP KEEP THE FRONT BLOCKS IN PLACE.
3. CONCRETE BLOCKS SHALL BE PLACED ON THEIR SIDES ACROSS THE FRONT OF THE INLET AND ABUTTING THE SPACER BLOCKS.
4. WIRE MESH WEBBING SHALL BE PLACED OVER THE OUTSIDE VERTICAL FACE OF THE CONCRETE BLOCKS TO PREVENT STONE FROM BEING WASHED THROUGH THE HOLES IN THE BLOCKS. WIRE MESH WITH 1/2-INCH OPENINGS SHALL BE USED.
5. COARSE AGGREGATE SHALL BE PILED AGAINST THE WIRE TO THE TOP OF THE BARRIER.
6. IF THE STONE BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PERFORMS ITS FUNCTION, THE STONE MUST BE PULLED AWAY FROM THE BLOCKS AND CLEANED OR REPLACED.

B) INSPECTION AND MAINTENANCE:

1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN EVENT OF 1/2-INCH OR GREATER, AND REPAIRS SHALL BE MADE AS NEEDED.
2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA SO THAT IT WILL NOT ERODE.
3. STRUCTURES SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

SOURCE: MODIFIED FROM VA. DCR, 1992

AMERICAN PUBLIC WORKS ASSOCIATION	
APWA	KANSAS CITY METROPOLITAN CHAPTER
BLOCK AND GRAVEL CURB INLET PROTECTION	STANDARD DRAWING NUMBER ESC-26 ADOPTED:

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USACE / NAVFAC / AFCESA / NASA **UFGS-32 92 19 (October 2006)**

Preparing Activity: NAVFAC **Replacing without change UFGS-02921 (April 2006)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2010
****

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SECTION 32 92 19

SEEDING

10/06

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-- End of Section Table of Contents --

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USACE / NAVFAC / AFCESA / NASA	**UFGS-32 92 19 (October 2006)**

Preparing Activity: NAVFAC	**Replacing without change UFGS-02921 (April 2006)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2010
****

SECTION 32 92 19

SEEDING
10/06

****
NOTE: This guide specification covers the requirements for seeding.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of Technical Proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: The following information shall be shown on the project drawings:

1. Clearly indicate all areas to be turfed and if more than one type of turf is specified, delineate areas for each type.

2. All draft turf specifications shall be submitted to the cognizant Landscape Architect/Natural Resources Specialist for review to ensure that the specifications are in accordance with environmental conditions peculiar to the project areas.
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 602	(2007) Agricultural Liming Materials
ASTM D 4427	(2007) Peat Samples by Laboratory Testing
ASTM D 4972	(2001; R 2007) pH of Soils

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1940; R 1988; R 1998) Federal Seed Act
DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

1.2 DEFINITIONS

1.2.1 Stand of [Turf][_____]

95 percent ground cover of the established species.

1.3 RELATED REQUIREMENTS

[Section 31 00 00 EARTHWORK], [Section 32 84 24 IRRIGATION SPRINKLER SYSTEMS], [Section 32 96 00 TRANSPLANTING EXTERIOR PLANTS], [Section 32 92 23 SODDING], [Section 32 92 26 SPRIGGING], [Section 32 93 00 EXTERIOR PLANTS], and Section 32 05 33 LANDSCAPE ESTABLISHMENT applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A “G” following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a “G”. Only delete an existing “G” if the submittal item is not complex and can be reviewed through the Contractor’s Quality Control system. Only add a “G” if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Wood cellulose fiber mulch

Fertilizer

Include physical characteristics, and recommendations.

SD-06 Test Reports

****
NOTE: In states that require certification, adjust testing requirements to suit local conditions.
****

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

State certification and approval for seed

SD-08 Manufacturer's Instructions

Erosion Control Materials

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.5.1.2 [Fertilizer] [Gypsum] [Sulfur] [Iron] [and] [Lime] Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, [fertilizer] [gypsum] [sulphur] [iron] [and] [lime] may be furnished in bulk with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Seed, [Fertilizer] [Gypsum] [Sulfur] [Iron] [and] [Lime] Storage

Store in cool, dry locations away from contaminants.

1.5.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

1.5.2.3 Handling

Do not drop or dump materials from vehicles.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

****
NOTE: Check with the local Agriculture County Extension Service to determine proper planting seasons for specie specified, for the optimum cover depth, and for the proper rate of application for sowing and drilling seed as this rate varies with the specie of seed used and local conditions. Allow for planting period in the construction completion time. Delete time restrictions for continuous growing conditions.
****

1.6.1 Restrictions

Do not plant when the ground is [frozen,] [snow covered,] muddy, or when air temperature exceeds [32] [____] degrees Celsius [90] [_____] degrees Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Seed

Apply seed within twenty four hours after seed bed preparation.

PART 2 PRODUCTS

2.1 SEED

****
NOTE: The specific species and varieties used should be based on recommendations of the local Agriculture County Extension Service Office.
****

2.1.1 Classification

Provide [State-certified] [State-approved] [Endophyte-enhanced] seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of the [Contracting Officer] [_____].

2.1.2 Planting Dates

Planting Season	Planting Dates
[Season 1]	[_____]
[Season 2]	[_____]
[Temporary Seeding]	[_____]

2.1.3 Seed Purity

Botanical Name	Common Name	Min. Percent Pure Seed	Min. Percent Germination and Hard Seed	Max. Percent Weed Seed
[_____]	[_____]	[_____]	[_____]	[_____]
[_____]	[_____]	[_____]	[_____]	[_____]
[_____]	[_____]	[_____]	[_____]	[_____]

2.1.4 Seed Mixture by Weight

Planting Season	Variety	Percent (by Weight)
[Season 1]	[_____]	[_____]
	[_____]	[_____]

Planting Season	Variety	Percent (by Weight)
[Season 2]	[_____]	[_____]
	[_____]	[_____]
[Temporary Seeding]	[_____]	[_____]
	[_____]	[_____]

Proportion seed mixtures by weight. Temporary seeding must later be replaced by [Season 1][Season 2] plantings for a permanent stand of grass. The same requirements of turf establishment for [Season 1][Season 2] apply for temporary seeding.

2.2 TOPSOIL

****
NOTE: If topsoil properties are included in another section of Division 2, delete this paragraph and include a cross-reference to the appropriate section. Otherwise, select appropriate paragraphs on topsoil. Check with the local Agriculture County Extension Service Office for soil properties appropriate for the plant materials to be planted. Where suitable topsoil is available within limits of the work area, stripping and stockpiling of topsoil should be included in the applicable section of Division 2 of the specification. If suitable topsoil is not available within the limits of the work area, it should generally be the Contractor's option to either treat the soil of the graded areas with fertilizer and supplements so as to be conducive to turf establishment and maintenance, or to transport topsoil to the project site. Modify pH range for specified turf and geographical requirements.
****

2.2.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section [31 00 00 EARTHWORK][31 23 00.00 20 EXCAVATION AND FILL].

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be [furnished by the Contractor] [obtained from topsoil borrow areas indicated].

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 19 mm 3/4 inch, with maximum 3 percent retained on 6 mm 1/4 inch screen. The pH shall be tested in accordance with ASTM D 4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components

shall conform to the following limits:

Silt	[25-50][7 to 17][_____] percent
Clay	[10-30][4 to 12][_____] percent
Sand	[20-35][70 to 82][_____] percent
pH	[5.5 to 7.0][_____]
Soluble Salts	[600] [_____] ppm maximum

2.3 SOIL CONDITIONERS

****
NOTE: Prior to including these provisions in project specifications, perform tests of on-site topsoil to determine its suitability and the possible need of pH adjusters or soil conditioners. Delete these requirements in developed areas and on small projects where planting is minimal.
****

Add conditioners to topsoil as required to bring into compliance with "composition" standard for topsoil as specified herein.

2.3.1 Lime

****
NOTE: Use ASTM C 602 calcium carbonate equivalent (C.C.E.) as specified in Table 1: for burnt lime, C.C.E. shall not be less than 140 percent; for hydrated lime, C.C.E. shall not be less than 110 percent; and for limestone, C.C.E. shall not be less than 80 percent.
****

Commercial grade [hydrate] [or] [burnt] limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C 602 of not less than [_____] percent.

2.3.2 Aluminum Sulfate

Commercial grade.

2.3.3 Sulfur

100 percent elemental

2.3.4 Iron

100 percent elemental

2.3.5 Peat

Natural product of [peat moss] derived from a freshwater site and conforming to [ASTM D 4427] [as modified herein]. Shred and granulate peat to pass a 12.5 mm 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.3.6 Sand

Clean and free of materials harmful to plants.

2.3.7 Perlite

Horticultural grade.

2.3.8 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.3.8.1 Particle Size

Minimum percent by weight passing:

4.75 mmNo. 4 mesh screen	95
2.36 mmNo. 8 mesh screen	80

2.3.8.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.9 Gypsum

Coarsely ground gypsum comprised of calcium sulfate dihydrate 61 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 850 micrometers 20 mesh screen, 100 percent passing thru 970 micrometers 16 mesh screen.

2.3.10 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 650 degrees C. 1200 degrees F. Gradation: A minimum 90 percent shall pass a 2.36 mm No. 8 sieve; a minimum 99 percent shall be retained on a 0.250 mm No. 60 sieve; and a maximum 2 percent shall pass a 0.150 mm No. 100 sieve. Bulk density: A maximum 640 kilogram per cubic meter 40 pounds per cubic foot.

2.4 FERTILIZER

****
NOTE: Check with the local Agriculture County Extension Service Office for recommended fertilizer mixture for local conditions.
****

2.4.1 Granular Fertilizer

[Organic][synthetic], granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:

[_____] percent available nitrogen
[_____] percent available phosphorus
[_____] percent available potassium
[_____] percent sulfur
[[_____] percent iron]

2.4.2 Hydroseeding Fertilizer

Controlled release fertilizer, to use with hydroseeding and composed of pills coated with plastic resin to provide a continuous release of nutrients for at least 6 months and containing the following minimum percentages, by weight, of plant food nutrients.

[_____] percent available nitrogen
[_____] percent available phosphorus
[_____] percent available potassium
[[_____] percent sulfur]
[[_____] percent iron]

2.5 MULCH

****
NOTE: Check with the local Agriculture County Extension Service Office to determine choice of mulch most suitable for the project area. Specify only one type of mulch.
****

Mulch shall be free from noxious weeds, mold, and other deleterious materials.

2.5.1 Straw

Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

2.5.2 Hay

Air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Hay shall be sterile, containing no fertile seed.

2.5.3 Wood Cellulose Fiber Mulch

****
NOTE: Wood cellulose fiber mulches have been successful on level areas or on slopes with slight grades where sufficient moisture is present to obtain a quick germination of grass seed. The material should be hydraulically applied at the following rates: Areas up to and including 3 to 1 slopes, at the rate of 1,120 kg per 10,000 sq. m 1,000 pounds per acre; areas steeper than 3 to 1 at the rate of 1,568 kg per 10,000 sq. m 1,400 pounds per acre. It should not be specified for slopes 2 to 1 or greater in areas where drought may prevent germination of the seed or where runoff from heavy rains may cut gullies through the fiber mulch. In these areas use erosion control materials such as specified in paragraph entitled "Erosion Control Material."
****

Use recovered materials of either paper-based (100 percent) or wood-based

(100 percent) hydraulic mulch. Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 5.5 to 8.2 [_____]. Use with hydraulic application of grass seed and fertilizer.

2.6 WATER

****

NOTE: When water is Government furnished, locate the source. Recycled or reclaimed irrigation water may be available through a tertiary treatment plant on or off site. It is preferred that this type of water be used for irrigation whenever possible. Check project specific conditions.

Unless otherwise directed, water shall be the responsibility of the Contractor. Water source shall be potable or non-potable. If non-potable edit specification accordingly. Source of water shall be approved by the Contracting Officer and shall be of suitable quality for irrigation, containing no elements toxic to plant life.

Coordinate information presented here with Section 01 50 00.00 20, TEMPORARY FACILITIES AND CONTROLS.

****

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation, containing no elements toxic to plant life.

[2.7 EROSION CONTROL MATERIALS

****

NOTE: The Contractor may propose other types of erosion control material, based on site conditions.

****

Erosion control material shall conform to the following:

[2.7.1 Erosion Control Blanket

[100 percent agricultural straw][70 percent agricultural straw/30 percent coconut fiber matrix] stitched with a degradable nettings, designed to degrade within [12 months][18 months].

][2.7.2 Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 19 to 25 mm 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

][2.7.3 Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 605 grams per meter 1.22 pounds per linear yard and 1200 mm 4 feet wide with mesh openings of approximately 25 mm 1 inch square.

][2.7.4 Hydrophilic Colloids

Hydrophilic colloids shall be physiologically harmless to plant and animal life without phytotoxic agents. Colloids shall be naturally occurring, silicate powder based, and shall form a water insoluble membrane after curing. Colloids shall resist mold growth.

]2.7.5 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

]PART 3 EXECUTION

3.1 PREPARATION

3.1.1 EXTENT OF WORK

Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.1.1 Topsoil

Provide 102 mm4 inches of [off-site topsoil][on-site topsoil][existing soil] to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate [fertilizer] [pH adjusters] [soil conditioners] into soil a minimum depth of [100] [_____] mm [4] [_____] inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 19 mm 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

[3.1.1.2 Soil Conditioner Application Rates

****
NOTE: Check with the local Agriculture County Extension Service and specify amounts applicable for the project area.
****

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

[Lime [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

[Sulfur [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

[Iron [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

[Aluminum Sulfate [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square

feet.]]

[Peat [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters[_____] cubic yards per 1000 square feet.]]

[Sand [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters[_____] cubic yards per 1000 square feet.]]

[Perlite [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters[_____] cubic yards per 1000 square feet.]]

[Compost Derivatives [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters [_____] cubic yards per 1000 square feet.]]

[Calcined Clay [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters[_____] cubic yards per 1000 square feet.]]

[Gypsum [[_____] cubic meters per square meter[_____] cubic yard per acre] [[_____] cubic meters per 100 square meters[_____] cubic yards per 1000 square feet.]]

][3.1.1.3 Fertilizer Application Rates

****
NOTE: Check with the local Agriculture County Extension Service and specify amounts applicable for the project area. Two fertilizer applications may be required when hydroseeding with wood fiber mulch.
****

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

[Organic Granular Fertilizer [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

[Synthetic Fertilizer [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

[Hydroseeding Fertilizer [[_____] kg per square meter[_____] pounds per acre] [[_____] kg per 100 square meters[_____] pounds per 1000 square feet.]]

]3.2 SEEDING

3.2.1 Seed Application Seasons and Conditions

****
NOTE: Check with the local Agriculture County Extension Service to determine proper planting seasons for specie specified, for the optimum cover

depth, and for the proper rate of application for sowing and drilling seed as this rate varies with the specie of seed used and local conditions. Allow for planting period in the construction completion time. Delete time restrictions for continuous growing conditions.
****

****
NOTE: Delete the last two lines of this paragraph when hydroseeding is selected as the only seed application method.
****

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy [frozen] [snow covered] or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above seeding dates or conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.2.2 Seed Application Method

Seeding method shall be [broadcasted and drop seeding][drill seeding][hydroseeding].

[3.2.2.1 Broadcast and Drop Seeding

Seed shall be uniformly broadcast at the rate of [_____]kilograms per hectarepounds per 1000 square feet. Use broadcast or drop seeders. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing. Cover seed uniformly to a maximum depth of [6] [_____] mm 1/4 inch in clay soils and [13] [_____] mm [1/2] [_____] inch in sandy soils by means of spike-tooth harrow, cultipacker, raking or other approved devices.

][3.2.2.2 Drill Seeding

****
NOTE: Check with the local Agriculture County Extension Service to determine proper planting seasons for specie specified, for the optimum cover depth, and for the proper rate of application for sowing and drilling seed as this rate varies with the specie of seed used and local conditions. Allow for planting period in the construction completion time. Delete time restrictions for continuous growing conditions.
****

Seed shall be drilled at the rate of [_____]kilograms per hectarepounds per 1000 square feet. Use [cultipacker seeders] [grass seed drills] [_____]. Drill seed uniformly to average depth of [13] [_____] mm [1/2] [_____] inch.

][3.2.2.3 Hydroseeding

****

NOTE: Check with the local Agriculture County Extension Service to determine rate of application. This rate will vary due to site requirements for fertilizer, mulch material, and rates of seeding.
****

First, mix water and fiber. Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. Fiber shall be added at 1,000 pounds, dry weight, per acre 11.2 kg per 100 square meter. Then add and mix seed and fertilizer to produce a homogeneous slurry. Seed shall be mixed to ensure broadcasting at the rate of [_____]kilograms per hectarepounds per 1000 square feet. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

]3.2.3 Mulching

[3.2.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 0.75 metric tons per hectare 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

][3.2.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

][3.2.3.3 Asphalt Adhesive Tackifier

Asphalt adhesive tackifier shall be sprayed at a rate between 666 to 866 liters per hectare 10 to 13 gallons per 1000 square feet. Sunlight shall not be completely excluded from penetrating to the ground surface.

][3.2.3.4 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

][3.2.3.5 Asphalt Adhesive Coated Mulch

Hay or straw mulch may be spread simultaneously with asphalt adhesive applied at a rate between 666 to 866 liters per hectare 10 to 13 gallons per 1000 square feet, using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly over the surface. Sunlight shall not be completely excluded from penetrating to the ground surface.

][3.2.4 Rolling

****
NOTE: Normally the roller weight should not exceed 134 kg per m 90 pounds per foot of roller width. Light rolling is needed on newly seeded and sprigged areas to firm the seed or sprigs into contact with the soil for optimum germination and growth. However, excessive soil compaction beyond this firming action will reduce the desirable percentages of air and water spaces in good growing topsoil.
****

Immediately after seeding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding [134] [_____] kg per m [90] [_____] pounds for each foot of roller width. [If seeding is performed with cultipacker-type seeder or by hydroseeding, rolling may be eliminated.]

]3.2.5 Erosion Control Material

****
NOTE: Specify erosion control where water concentrates and flows across areas at velocities which create an erosion hazard. Allow Contractor option for type of erosion control material, unless project specific requirements dictate otherwise.
****

Install in accordance with manufacturer's instructions, where indicated or as directed by the Contracting Officer.

3.2.6 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of [50] [_____] mm [2] [_____] inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

[3.4 RENOVATION OF EXISTING TURF AREA

[3.4.1 Aeration

Upon completion of weed eradication operations and Contracting Officer's approval to proceed, aerate turf areas indicated , by approved device. Core, by pulling soil plugs, to a minimum depth of [_____] mm [_____] inches. [Leave all soil plugs, that are produced, in the turf area.] [Remove all debris generated during this operation off site.] [After aeration operations are complete, topdress entire area [6.35 mm1/4 inch] [12.70 mm 1/2 inch] depth with the following mixture:

[[_____] percent sand]
[[_____] percent humus]
[[_____] percent gypsum]
[[_____] percent organic fertilizer]

[[_____] percent synthetic fertilizer]

Blend all parts of topdressing mixture to a uniform consistency throughout.] Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean all soil plugs off of other paving when work is complete.

][3.4.2 Vertical Mowing

Upon completion of aerating operation and Contracting Officer's approval to proceed, vertical mow turf areas indicated, by approved device, to a depth of [6 mm1/4 inch] [13 mm1/2 inch] above existing soil level, to reduce thatch build-up, grain, and surface compaction. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work is complete. Remove all debris generated during this operation off site.

][3.4.3 Dethatching

Upon completion of aerating operation and Contracting Officer's approval to proceed, dethatch turf areas indicated, by approved device, to a depth of [6 mm1/4 inch] [13 mm1/2 inch] below existing soil level, to reduce thatch build-up, grain, and surface compaction. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work is complete. Remove all debris generated during this operation off site.

][3.4.4 Overseeding

****
NOTE: Drill seeding is the most viable method of overseeding when significant vegetation remains. Existing vegetative cover (live or dead) may prevent desired soil contact when seeded by other methods.
****

Apply seed in accordance with applicable portions of paragraph entitled "Seed Application Method" at rates in accordance with paragraph entitled "Seed Composition."

]]3.5 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations at the Contractor's expense. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

APPENDIX H
Spill Reporting

Procedures for Determining if a Hazardous Material Spill is a Reportable Quantity

1) First determine the type and quantity of material that has been spilled.

2) Obtain a material safety data sheet (MSDS) for the spilled material and determine whether any of the constituents are listed in Table 302.4 in 40 CFR 302.

3) If none of the constituents in the spilled material are listed in the table (excluding ethylene glycol), the spill is not reportable.

4) If the constituents in the spilled material are listed in the table, use the following equation to determine the pounds of material spilled:

$$\text{Pounds Spilled} = (V)\ (Wt\%)\ (Sg)\ (0.0834)$$

Where:

V = Volume of the material spilled, in gallons

Wt% = The weight percent of the constituents in the spilled material (see the MSDS)

Sg = Specific gravity of spilled material (see MSDS)

For Example:

V = 7 gallons

Wt% = 3.5

Sg = 1.04

Pounds Spilled = (7) (3.5) (1.04) (0.0834) = 2.13 pounds

5) If, based on the calculation, the pounds spilled are greater than the Final RQ (reportable quantity) value listed in Table 302.4 of 40 CFR 302 or the State's reportable quantity minimum amount, the spill must be reported to the appropriate federal, state, and local agencies.

Advanced Individual Training Complex Project

Storm Water Pollution Prevention Plan

SPILL REPORT FORM

Spill Reported By: _____ _____
Name Phone Number

Date Reported: _____ Time: _____

Date of Spill: _____ Time: _____

Name of Facility: _____

Legal Description: ____ 1/4 ____ 1/4 ____ 1/4 SEC ____, TWP ____, Range ____,

County _____

Describe Spill Location and Events Leading to Spill: _____

_____

_____

_____

Material Spilled: _____

Source of Spill: _____

Amount Spilled (Gallons or Pounds): _____

Amount Spilled to Waterway (Gallons or Pounds): _____

Nearest Municipality: _____

Containment or Cleanup Action: _____

_____

List Environmental Damage (fish kill, etc.): _____

_____

List Injuries or Personal Contamination: _____

_____

Date and Time Cleanup Completed or Terminated: _____

If Cleanup Delayed, Nature and Duration of Delay: _____

_____

Description of Materials Contaminated: _____

_____

Approximate Depth of Soil Excavation: _____

Action To Be Taken to Prevent Future Spills: _____

_____

_____

Agencies Notified:

Local: _____ Date: _____

State: _____ Date: _____

Federal: _____ Date: _____

Signed: _____
Contractor Superintendent or
Environmental Inspector

Appendix DD

Water Quality Analysis

What does this report mean? The report shows the results of our water quality analyses. Every regulated contaminant that was detected in the water, even in the most minute traces, is listed here. The report contains the name of each substance, the highest level allowed by regulation (MCL), and the ideal goals for public health, the amount detected, the usual sources of such contaminants, footnotes explaining our finding, and a key to units of measurements.

Maximum Contaminant Level or MCL: The highest level of a contaminant allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal or MCLG: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Action Level: The concentration of a contaminant which, if exceeded, triggers a treatment or other requirement, a water system must follow.

Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Turbidity: Measurement of the cloudiness of the water. It is monitored because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

Definitions:

Pci/L=Pico curies per liter (radioactivity measurement)
MCLG=Maximum Contaminant Level Goal
NTU=Nephelometric Turbidity units
MCL=Maximum Contaminant Level
TT=Treatment Technique
AL=Action Level
ppm=parts per million or milligrams per liter (mg/L)
ppb=parts per billion or micrograms per liter (ug/L)
BPQL=Below practical quantitive limits

2005 WATER QUALITY DATA
REGULATED AT THE TREATMENT PLANT

CONTAMINANT	DATE TESTED	UNIT	MCL	MCLG	DETECTED LEVEL	RANGE	MAJOR SOURCE	VIOLATION
MERCURY (INORGANIC)	10/31/2005	ppb	2	2	BPQL	NONE	Erosion of natural deposit	NO
FLUORIDE	11/07/2005	ppm	4	4	1.36	.12-1.36	Erosion of natural deposit Treatment addition	NO
ARESNIC	10/31/2005	ppb	10	0	<2	NONE	Erosion of natural deposit	NO
SELENIUM	10/31/2005	ppb	50	50	<1	NONE	Erosion of natural deposit	NO
NITRATE-NITRITE	10/2005	ppm	10	10	<.10	NONE	Runoff from fertilizer use; leaching from spectic tanks, sewage, erosion of natural deposit	NO
ALPHA EMITTERS	2002	pCi/L	15	0	.3025	.18- .51	Erosion of natural deposits	NO
BETA/PHOTON EMITTERS	2002	pCi/L	50	0	2.93	2.66-3.22	Decay of natural and man-made deposits	NO
TURBIDITY	8/12/2005	NTU	TT=. 3NTU TT=% OF SAMPLES <.3 NTU	0	.65 100%	NONE	Soil runoff	NO
BARIUM	10/31/2005	ppm	2	2	.082	NONE	Discharge of drilling wastes; discharge from metal refineries; Erosion of natural deposit	NO
TOTAL ORGANIC CARBON* (results based on a yearly avg ratio)	12/2005	ppm	TT=Annual avg % removal based on raw water TOC levels and alkalinity. To be in compliance yearly avg ratio must be 1 or greater than 1.	N/A	SEE BELOW yearly avg ratio: 1.02		Naturally present in environment. Has no health effects. Provides a medium for the formation of disinfection by products, including Trihalomethanes and Haloacetic Acids.	YES

* MONTH	1/05	02/05	03/05	04/05	05/05	06/05	07/05	08/05	09/05	10/05	11/05	12/05
SOURCE WATER TOC	4.53	4.93	4.73	4.61	5.55	4.43	4.53	4.41	4.31	4.52	4.79	4.52
SOURCE WATER ALKALINITY	123	129	134	131	131	137	118	108	107	112	118	125
FINISHED WATER TOC	3.42	3.37	3.22	3.46	4.46	3.36	3.18	2.99	2.87	2.96	3.31	3.50
Required % removal	25%	25%	25%	25%	25%	25%	35%	35%	35%	35%	35%	25%
Actual % removal	25%	32 %	32 %	25%	20%	24%	30%	32%	33%	35%	31%	23%

REGULATED IN THE DISTRIBUTION SYSTEM

CONTAMINANT	DATE TESTED	UNIT	MCL	MCLG	DETECTED LEVEL	RANGE OF DETECTION	MAJOR SOURCE	VIOLATION
TOTAL COLIFORMS	12/2005 (Monthly)	% Positive	No more than 5% positive	0	0	<1 % positive	Naturally present in the environment	NO
TOTAL TRIHALOMETHANES	12/2005 (quarterly)	ppb	80 Avg	0	63.18 (highest quarter)	31.78-63.18	by-product of chlorination	NO
HALOACTIC ACIDS (HAA5)	12/2005 (quarterly)	ppb	60 Avg	0	13.56 (highest quarter)	<10-19.00	by-product of chlorination	NO
BROMATE	12/2005 (monthly)	ppb	10	0	174 (highest month)	<5-174	by-product of ozone disinfection	YES

REGULATED AT THE CUSTOMERS TAP

CONTAMINANT	DATE TESTED	UNIT	MCL	MCLG	DETECTED LEVEL	RANGE	MAJOR SOURCE	VIOLATION
COPPER	8/2003	ppm	AL=1.3 ppm	1.3	1.1	0 sites>AL	Corrosion of household plumbing systems	NO
LEAD	8/2003	ppb	AL=15 ppb	0	3.1	0 sites>AL	Corrosion of household plumbing systems	NO

SPECIAL INFO AVAILABLE: Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone transplants, people with HIV/Aids or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the safe drinking water hotline 1-800-426-4791.

Your water supply is safe in ALL water quality parameters. If you have any questions, please contact the Water Treatment Plant at 580-529-2703.

VOLUME 1 NO. 8 APRIL 20, 2006

CITY OF LAWTON WATER TREATMENT PLANT
2005 WATER QUALITY REPORT

BILLING/CUSTOMER SERVICE INFORMATION: (580) 581-3308 **W EB SITES: www.cityof.lawton.ok.us or www.epa.gov/safewater/**

WATER QUALITY

The City of Lawton is committed to providing residents with a safe and reliable supply of high-quality drinking water. This annual **A Consumer Confidence Report≅** required by the Safe Drinking Water Act (SDWA), tells you where your water comes from, how the treated water quality compares to the required quality standards and other things you should know about drinking water.

CRYPTOSPORIDIUM

Cryptosporidium is a microscopic organism that when ingested can result in diarrhea, fever and other gastrointestinal symptoms. This organism is found in most lakes and streams. Cryptosporidium comes from animals and humans whom are the carriers of the organism and have contact with the source water supplies. Cryptosporidium is eliminated by effective treatment combinations including filtration, sedimentation and disinfection.

TRIHALOMETHANES *BY-PRODUCTS OF CHLORINATION*

Million of people every year are affected by microbial contaminants (bacteria) in drinking water due to inadequate disinfection of the water supply. This is a real problem. AMicrobial risks are real≅. Chlorination of your water system is essential in order to protect public health. However, when chlorine is introduced into untreated water, chlorine and naturally occurring organics in the water form by products called TRIHALOMETHANES (THMS). Some people who drink water containing THMS in excess of the MCL over many years may experience problems with their liver, kidneys or central nervous system, and may have an increased risk of cancer.

TOC VIOLATIONS

During the first, second and third quarter of 2005 the Water Treatment Plant was out of compliance for the required TOC removal. TOC has no health effects; however, TOC can provide a medium for the formation of disinfectant by products. The Water Treatment Plant is now in full compliance with this requirement.

BROMATE MCL VIOLATION

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we are doing to correct this situation.

The average of the eight bromate samples submitted by the City of Lawton Water Treatment Plant for the twelve months of 2005 is .033 mg/L. This value exceeds the MCL of .010 mg/L for bromate; therefore, the WTP is in violation for exceeding the MCL for bromate.

The United States Environmental Protection Agency (EPA) sets drinking water standards and has determined that bromate is a health concern at certain high levels of exposure. Bromate is formed as a by-product of ozone disinfection of drinking water. Ozone reacts with naturally occurring bromide in water to form bromate. The EPA has set a drinking water standard to limit exposure to bromate.

WHAT SHOULD I DO? **You do not need to use an alternative (e.g. bottled) water supply**. However, if you have specific health concerns, consult your doctor.

WHAT DOES THIS MEAN? This is not an immediate risk. If it had been, you would have been notified immediately. However, some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.

WHAT HAPPENED? WHAT IS BEING DONE?

The water treatment plant will try to control Bromate formation by lowering the pH of the water through the ozonization process and by lowering the ozone concentration used for disinfection.

SOURCE WATER PROTECTION

The City of Lawton is in the process of putting together a source water protection program. This is an ongoing effort to identify sources of possible pollution.

As these sources are identified, we will work to eliminate this pollution or to minimize its effect on the water supply. Your help is needed for this program to succeed. For more information, please visit www.epa.gov/owow/watershed.

Sources of pollution on the Lake Lawtonka or Lake Ellsworth reservoirs or their watershed should be reported to the Water Treatment plant by calling 580-529-2703

Please use care when using pesticides or herbicides as over application can runoff into the reservoir. Septic tanks should be serviced regularly to keep nutrients such as nitrogen and phosphorus out of the reservoir.

MONITORING REQUIREMENT NOT MET

Our water system violated a drinking water standard over the past year. Even though this was not an emergency, as our customers, you have a right to know what happened and what we did to correct this situation.

We are required to monitor your drinking water for specific contaminants on a regular basis. The results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During September –December 2005 we did not monitor or did not complete all monitoring for Bromate and therefore cannot be sure of the quality of our drinking water during that time.

WHAT SHOULD I DO?

There is nothing you need to do at this time.

WHAT HAPPENED? WHAT IS BEING DONE?

In the month of September 2005 the laboratory doing the WTP compliance analysis for Bromate lost its certification for this analysis. The WTP was notified of this in March 2006 and has started sending the monthly compliance sample to the ODEQ laboratory. The monthly analysis for Bromate for 6 months was performed by a laboratory that was not certified for that analysis and as such those results cannot be relied on for accuracy.

For more information, please contact David Herring at 580-529-2703.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

WATER INFORMATION

TOTAL WATER TREATED: 6,632,700,000

DAILY AVG TREATED: 18,171,781

MAX DAILY FLOW: 28,100,000

WATER PUMPED FROM ELLSWORTH: 2,850,728,000

WATER PUMPED FROM WAURIKA: 35,099,000

TOTAL RAINFALL: 20.84”

AVG ATMOSPHERIC TEMPERATURE: 62 **WATER**: 63

PH RANGE: 6.76-9.03

HARDNESS 157 PPM OR 9.16 GRAINS/GAL

ALKALINITY: 111 PPM

FLUORIDE: .99 PPM

TURBIDITY: .077 NTU

SOURCES OF WATER FOR THE CITY OF LAWTON

The water for the City of Lawton comes entirely from surface sources. The primary water supply is Lake Lawtonka. Lake Lawtonka has a watershed that covers approximately 92 square miles. Lake Ellsworth and Lake Waurika are the city’s secondary water supplies.

The watershed for Lake Ellsworth covers approximately 249 square miles, while the Lake Waurika watershed covers 562 square miles.

As water travels over the land’s surface or through the ground, it dissolves naturally occurring minerals and radioactive material, and can be polluted by animals or human activity.

Contaminants that might be expected in untreated water include: biological contaminants, such as viruses and bacteria; inorganic contaminants, such as salts and metals; pesticides and herbicides; organic contaminants from industrial or petroleum use and radioactive materials. Drinking water, including bottled water, may reasonably be expected

to contain at least small amounts of some contaminants. Presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the ***U.S. Environmental Protection Agency=s (EPA) Safe Drinking Water Hotline at* 1-800-426-4791.**

PRSRT STD
US POSTAGE
PAID
PERMIT NO. 46
LAWTON OK

LAWTON WATER TREATMENT PLANT
PO BOX 27
MEDICINE PARK OK 73557

Appendix EE

American Water Enterprises (AWE) – Design Criteria and Specifications

Water & Wastewater System Improvements within Design-Build Project footprint

DRAFT FOR DISCUSSION:

Presented herein is a proposed procedure for planning, design, construction, inspection and acceptance of improvements to the water and wastewater utilities at Fort Sill in cooperation with Design Contractors (DC) and the other BRAC related construction project contractors and American Water Enterprises (AWE) within the designated project limits. For the purposes of this discussion paper, the DC projects could also include projects within the soon to be privatized housing areas.

(It is understood that this document outlines an agreed upon procedure that will need to be reviewed by the contracting staff for the AWE UP contract and the COE's contracting staff for the DC)

Overview:

This procedure is to be used when improvements to the water and wastewater utility system are inside project limits of Design-Build contracts managed by the Army at Fort Sill. This could also include housing privatization and the projects related to the BRAC construction. The Army intends to embark on numerous projects via Design Build and Design Bid Build projects at Fort Sill beginning in 2006. Also on the horizon is housing privatization. When housing privatization and the projects related to the BRAC related construction projects occur it is imperative to have significant cooperation between AWE and DC with respect to the water and wastewater utility system improvements planned to be designed and built by DC. It is also imperative to have all improvements to the water and wastewater systems designed and constructed according to AWE standards and specifications and to be done in coordination with the long-term water and wastewater system improvement plans of AWE. AWE must be involved in the design, coordination, and planning of such utility improvements because these changes can have larger implications to the overall performance of the system – the level of this impact to the system, base wide, can only be evaluated by AWE. It is also important to note that AWE is the owner and the permit holder for each of the water and wastewater utility systems at Fort Sill.

It is understood that the BRAC and RCI related projects will occur in several phases as will the related utility improvements for each of those phases.

The following procedure should be followed for water and wastewater utility improvements by the DC. This procedure is specific to the BRAC, DC, and Housing Privatization related construction projects and does not apply to other parts of the water and wastewater system at Fort Sill outside of the project areas. Water and wastewater systems improvements outside the project perimeter limits but necessary to service these projects will be designed built and constructed by AWE under normal contract modification practices.

The following steps are to be included in the process:

1. Planning - Conceptual and Schedule (Govt. w/AWE Participation)
2. Design Review –60%, and final (Govt. and AWE; AWE to provide cost for review).
3. Construction Permitting (ODEQ)
4. Quality Assurance(COE evaluations with supplement inspection by AWE)
5. Review, Acceptance and Transfer of Utility System Improvements

6. Warranty of Utility System Improvements by Contractor thru COE to AWE
7. Payment for services will be made by the Government – limited to acceptable industry market rates

Conceptual Planning

- AWE will take part in Army planning charrettes.
- At end of conceptual planning phase, AWE will provide over site and review costs.

Design and Design Review:

Subsequent to the Conceptual Planning Stage, the DC can proceed with the development of design drawings and specifications for the water and wastewater improvements when needed to support the project. These design plans must be reviewed and concurred by AWE.

- The DC shall submit 5 copies to AWE of the 60% design plans and specifications of the proposed improvements to the utility system.
- AWE will provide written comments to the DC representatives within 14 days of receipt of the plans. In some circumstances additional hydraulic modeling work may be required after these initial comments and recommendations in order to provide comments. In these circumstances, AWE will provide the DC and Government with the estimated schedule and cost to complete the additional modeling work.
- The DC shall submit 5 copies to AWE of the final design plans and specifications. Complete Final design drawings shall be sealed by an Oklahoma Professional Engineer. The DC will complete the Oklahoma Department of Environment Quality (ODEQ) permit application and submit to AWE for review.
- When the plans have been approved by AWE, they will be marked “Approved by AWE” and the DC will be notified in writing of such approval. The AWE approved plans will be used for application of construction permit with ODEQ.(Typically AWE requires 14 days and ODEQ could take up to 30 days for final design review for permitting.)
- AWE will review, sign and return the permit application to DC for submission to ODEQ within five (5) business days. DC will be responsible for any permit application fees to ODEQ.

Construction Permitting:

When the plans have been approved by ODEQ they will be marked “Approved by ODEQ” and the DC will be notified in writing of such approval. The ODEQ approved plans will be used for construction and as the basis for creating the as-built drawings.

Oklahoma Department of Environment Quality (ODEQ) has primacy for regulation of the water and wastewater system at Fort Sill. Proposed improvements to the water and wastewater system must be approved and officially permitted by ODEQ for the construction of utility improvements.

- Once the plans are approved by the ODEQ, the ~~DC~~ Construction Company (CC) working with the DC shall be responsible for all labor, equipment, and material to install the utility system improvements, using the ODEQ and AWE approved plans and specifications.

Construction Review:

- The COE will provide a Construction Quality Assurance (QA) Inspector for all water and wastewater construction. The CC will be required to provide a Quality Control (QC) Representative approved by the COE to oversee the construction.
- An AWE representative will provide periodic observation of construction work to provide Quality Assurance for the work. Should during the course of observing or reviewing construction work, the AWE representative discovers an unacceptable installation, the AWE representative will contact the COE inspector, who shall have the authority to cause the CC working with the DC to take corrective action to meet the ODEQ and AWE approved drawings and specifications. The COE will have available copies of all testing reports, daily reports, and work logs developed by the COEs QA at the Resident Office for AWE to review upon request. During the course of construction of AWE Facilities weekly meetings are to be held by COE with all concerned parties in attendance.

Review, Acceptance and Transfer of Utility System Improvements:

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- Upon completion of the utility system phase improvements, the ~~DC~~ CC working with the DC shall supply Army Corps of Engineers (COE) and AWE with as built drawings in an electronic format in accordance with the project requirements, and a detailed accounting of the value of the utility system improvements. If the work is completed in phases, separate DD Form 1354s with the corresponding acceptable dates will be issued to AWE from the Government. It is understood that the guarantee/assurance that the materials and workmanship and good utility practice meet AWE requirements is provided thru the approved specific requirements (plans and specifications) and by the in process construction inspections preformed by AWE, CCs QC, and the COEs QA.

It is understood that the completed newly constructed facilities will be transferred to AWE by the Government at completion of construction using a DD Form 1354 which will itemize the facility being transferred to AWE to include the cost of the facility and any pending punch list items.

- Within 14 days of receipt of the as built drawings from the DC or CC, AWE will provide a letter of acceptance of the as built drawings.

- Fort Sill, working with AWE will provide a contract modification to update the utility system inventory for the existing AWE Maintenance Contract.

Warranty of Utility Improvements:

COE to review requirements for bonding, warranty requirements, surety bond etc. The Contractors will have a bond with the COE to cover the construction of the facility plus validated construction deficiencies or problems with the system. The warranty will be in effect for a period of one year starting at the completion of the construction and acceptance by the Government.

Normal maintenance such as greasing of valves, etc, if required, will be the responsibility of AWE during this warranty period.

It is noted that during the warranty period, AWE owns the water and sewer systems per the Contract Modification. Thus, AWE would be responsible for providing adequate service and environmental permit compliance.

In the event warranty repairs are required, AWE shall notify its designated Contracting Officer in writing, documenting the deficiency. The Contracting Officer shall work with Ft Sill and the COE to substantiate the defective work claim and cause the work to be corrected to AWE standards and specifications by the Contractors. In the event the repairs must be made immediately to maintain adequate environmental compliance, safety of life or property, and/or service, AWE has the right, to undertake corrective action immediately, and notify the Contracting Officer or their designated representative as soon as possible, but no later than noon of the next business day. AWE will track all costs associated with the repairs including overhead and profit and submit the same to the Contracting Officer to seek reimbursement from Ft Sill. Ft Sill will pay AWE, and seek reimbursement from the Contractors directly.

Payment for AWE's Services:

- Government shall be responsible for all costs incurred by AWE including engineering, construction review; legal, overhead, administrative and other costs incurred by AWE in connection with the utility system improvements related to the housing privatization efforts and other BRAC related construction projects at Fort Sill.

- AWE's resident engineering and inspection services will normally be performed by AWE Utility Engineer. For those activities or periods that are in excess of the workload of the AWE Utility Engineer, the Government shall be responsible for the additional cost of AWE's resident engineering and inspection services required during construction and testing of the utility system improvements.

- All bills submitted by AWE to the Government for costs incurred by AWE in relation to this work shall be due and payable upon presentation to the Contracting Officer.

DESIGN CRITERIA – Included in RFP

WATER ANALYSIS – Included in RFP

DIVISION 1 - GENERAL REQUIREMENTS

Specification No.	Title	Pages
[1] 01000	GENERAL REQUIREMENTS	1
[1] 01200	GENERAL INSTRUCTIONS	4
[1] 01250	SCHEDULES	2
[1] 01300	SUBMITTALS	4
[1] 01500	TEMPORARY FACILITIES	2
[1] 01550	ENVIRONMENTAL CONTROLS	2
[1] 01600	MATERIALS AND EQUIPMENT	2
[1] 01700	PROJECT CLOSEOUT	5

DIVISION 2 - SITE WORK SPECIFICATIONS

Specification No.	Title	Pages
UTILITY MATERIALS		
[2] 02082	PRECAST CONCRETE MANHOLES	10
[2] 02084	FRAMES, GRATES, RINGS, AND COVERS	3
[2] 02085	VALVE BOXES, METER BOXES, AND METER VAULTS	6
[2] 02086	ADJUSTING MANHOLES, INLETS, AND VALVE BOXES TO GRADE	3
SITE DEMOLITION		
[1] 02221	REMOVING EXISTING PAVEMENTS AND STRUCTURES	3
[1] 02222	ABANDONMENT OF SEWERS	7
[1] 02233	CLEARING AND GRUBBING	2
EXCAVATION AND FILL		
[1] 02315	ROADWAY EXCAVATION	4
[1] 02316	EXCAVATION AND BACKFILL FOR STRUCTURES	8
[1] 02317	EXCAVATION AND BACKFILL FOR UTILITIES	14
[1] 02319	BORROW	2
[1] 02320	UTILITY BACKFILL MATERIALS	9
TUNNELING, BORING AND JACKING		
[2] 02427	PLASTIC LINER FOR LARGE-DIAMETER CONCRETE SEWERS AND STRUCTURES	11

[1] 02441 MICROTUNNELING AND PIPE JACKED TUNNELS 11
[1] 02447 AUGERING PIPE AND CONDUIT 8
[1] 02448 PIPE AND CASING AUGERING FOR SEWERS 6

PIPE MATERIALS
[2] 02501 DUCTILE IRON PIPE AND FITTINGS 8
[2] 02503 COPPER TUBING 2
[2] 02505 HIGH DENSITY POLYETHYLENE (HDPE) SOLID AND PROFILE WALL PIPE 6
[2] 02506 POLYVINYL CHLORIDE PIPE 8

WATER DISTRIBUTION
[2] 02511 WATERMAINS 21
[2] 02512 WATER TAP AND SERVICE LINE INSTALLATION 6
[2] 02513 WET CONNECTIONS 2
[2] 02514 DISINFECTION OF WATER LINES 3
[2] 02515 HYDROSTATIC TESTING OF PIPELINES 2
[2] 02516 CUT, PLUG, AND ABANDONMENT OF MAINS 2
[2] 02520 FIRE HYDRANTS 5
[2] 02521 GATE VALVES 6
[2] 02522 BUTTERFLY VALVES 7
[2] 02523 PRESSURE REDUCING VALVES 3
[2] 02524 AIR RELEASE AND VACUUM RELIEF VALVES 3
[2] 02525 TAPPING SLEEVES AND VALVES 4
[2] 02526 WATER METERS 8
[2] 02528 POLYETHYLENE WRAP 4

SANITARY SEWER
[2] 02531 GRAVITY SANITARY SEWERS 7
[2] 02532 SANITARY SEWER FORCE MAINS 5
[2] 02533 ACCEPTANCE TESTING FOR SANITARY SEWERS 12
[2] 02534 SANITARY SEWER SERVICE STUBS OR RECONNECTIONS.....7

SUBDRAINAGE
[1] 02621 GEOTEXTILE 3

BOUND BASE COURSES
[1] 02711 HOT MIX ASPHALT BASE COURSE 8
[1] 02712 CEMENT STABILIZED BASE COURSE 6

FLEXIBLE PAVING
[1] 02741 ASPHALT CONCRETE PAVEMENT 7

RIGID PAVING

[1] 02751 CONCRETE PAVING 12
[1] 02752 CONCRETE PAVEMENT JOINTS 6
[1] 02753 CONCRETE PAVEMENT CURING 3
[1] 02754 CONCRETE DRIVEWAYS 2

CURBS, GUTTERS AND SIDEWALKS

[1] 02771 CURB, CURB AND GUTTER, AND HEADERS 3
[1] 02772 CONCRETE MEDIANS AND DIRECTIONAL ISLANDS 2
[1] 02775 CONCRETE SIDEWALKS 5

PLANT PREPARTION

[1] 02911 TOPSOIL 2

SHRUB AND TREE TRANSPLANTING

[1] 02915 TREE PLANTING 6

LAWNS AND GRASS

[1] 02921 HYDROMULCH SEEDING 3
[1] 02922 SODDING 4

SITE RESTORATION AND REHABILITATION

[1] 02951 PAVEMENT REPAIR AND RESURFACING 3

DIVISION 3 - CONCRETE

[1] 03315 CONCRETE FOR UTILITY CONSTRUCTION 16

DIVISION 4 - MORTAR

[1] 04061 MORTAR 4
[1] 04210 BRICK MASONRY FOR UTILITY CONSTRUCTION 4

[1] All sections to be incorporated into Standard MasterSpec format used in each design/build RFP design drawing package by D/B contractor.

[2] Edited section included with Table of Contents for both RFP and Primary Infrastructure Packages. Remaining sections to be included in RFP but not in Primary Infrastructure Package.

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DIVISION 1

GENERAL REQUIREMENTS

01000 SCOPE 1
01001 WORK UNDER THIS CONTRACT 1
01002 INCLUSIONS 1

SECTION 01000

GENERAL REQUIREMENTS

01001 SCOPE OF WORK UNDER THIS CONTRACT

.01 The work to be done under this Contract includes the supply of materials, labor, equipment, permits, etc. necessary for the complete construction of the works shown on the Contract Drawings and as specified herein, and a guarantee of all workmanship and materials for a period specified herein.

.02 Refer to Special Provisions for the complete description of the work to be carried out for this contract.

01002 INCLUSIONS

.01 The following sections are included and form part of Division 1:

01000 General and Requirements
01200 General Instructions
01250 Schedules
01300 Submittals
01500 Temporary Facilities
01550 Environmental Controls
01600 Materials and Equipment
01700 Project Closeout

.02 A separate field office will be required for the Engineer on this project.

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01225 CO-ORDINATION OF THE WORK 3
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01227 SITE SIGNS AND NOTICES 4

SECTION 01200

GENERAL INSTRUCTIONS

01200 GENERAL INSTRUCTIONS

.01 The Contractor shall be responsible for the layout elevations, alignment of the work and shall verify all measurements and details of the existing equipment and structures necessary for the proper fitting and connection of the new work to it, before proceeding with the work. Any discrepancies between the drawings and the existing work shall be referred to the AW Project Manager. The Contractor is responsible for the proper fitting of the work and shall make such changes as necessary and directed by the AW Project Manager without additional cost to AW.

.02 The Contractor shall restrict all operations to within the limits of the easements and properties as shown on the drawings and staked in the field.

.03 The AW Project Manager at his discretion, may approve minor changes in the route or location of new watermains during construction. However, any such change in location shall not be considered as a basis for a claim for extra compensation, regardless of the reason for changing the location.

.04 Any work done during the winter months shall be carried to completion as quickly as possible. The Contractor shall supply all necessary heating, fuel, equipment and materials required to adequately protect the work from frost damage during and after laying or placing, all to the AW Project Manager's satisfaction.

01221 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

.01 Dimensions on drawings when witnessed by lines and arrow points, shall take precedence over measurements by scale.

.02 Larger scale drawings shall take precedence over those of smaller scale. Supplementary drawings and specifications supersede previous drawings and specifications.

.03 Words, phrases and abbreviations that have a well-known technical or trade meaning shall have that meaning in these specifications and drawings.

.04 In case of discrepancy between the drawings and specifications, figure dimension on the drawings shall govern, except where the dimension depends on the dimension of a specified product in which case the dimensions of the product shall govern. In the case of discrepancy in description of materials and methods, the specifications shall govern.

.05 All cases of discrepancy shall be referred to the AW Project Manager who shall give his decision in writing. The decision shall be consistent with the evident meaning and intention of the drawings and specifications and the above paragraphs.

.06 The location of undimensioned fixtures, outlets, conduits, piping, etc., is shown approximate. Actual location shall be made to suit job conditions as approved by AW Project Manager.

.07 The drawings and specifications are complementary and what is called for by either shall be as binding as if called for by both. It is the intention to provide for a finished piece of work complete in all essentials, including all items reasonably inferable from all of the Contract Documents, notwithstanding that every item necessarily involved may not be particularly mentioned. The Contractor shall not take advantage to the detriment of the AW's interest, of any manifestly unintentional errors or omissions should such exist. Where the quality of workmanship or materials is not specifically stated, the best quality shall be provided.

01222 REGULATING REQUIREMENTS

.01 Construction methods, equipment and all operations shall conform with the applicable regulations and amendments made under the applicable State Labor Act, Construction Safety Act, and any or all other Acts and By-laws in force to ensure the safety of the works and the Contractor's workmen and others at all times.

.02 The Contractor shall apply for, obtain and pay for all approvals and permits required for this project and will produce evidence of payment of the same to the AW Project Manager.

.03 AW will provide a clean set of Contract Drawings and Specifications for each application.

.04 The Contractor shall arrange for all regular inspections by authorities having jurisdiction and all final inspections required.

01223 NOTIFICATION OF INTERESTED PARTIES

.01 The Contractor shall be responsible for adequately protecting any public or private service or utility adjacent to the work.

.02 The Contractor's attention is drawn to particular requirements of the Specifications with respect to prior arrangements with and notifications to various parties before commencing work at specific locations.

.03 Prior to commencing construction adjacent to existing sewers, watermain pipes, gas pipes, communication lines, telephone lines or hydro cables, conduits, poles, street signs, etc., or obtaining stakeout of underground services or utilities, the Contractor shall notify the party concerned at least two full working days before commencing work in the vicinity.

01224 SITE ADMINISTRATION

.01 At all times during the course of the work, the Contractor shall provide suitable and adequate toilet facilities for all persons employed on the work, subject to approval of type, size, and location by the local authorities. The facilities shall be maintained in proper sanitary conditions, frequently disinfected and, if directed by the AW Project Manager, shall be removed from the work. Any contaminated soil and material shall be removed and replaced with fresh, clean material and the site left in a clean, sanitary condition.

.02 The Contractor shall provide and maintain on the site in a clean orderly condition, completely equipped first aid facilities which shall be readily accessible at all times to all his employees. The Contractor shall designate certain employees who are properly instructed to be in charge of first aid. At least one such employee shall always be available on the site while work is being carried on. A telephone call list for summoning aid, such as doctors, ambulances, pulmotors, and rescue squads from outside sources shall be conspicuously posted.

01225 CO-ORDINATION OF THE WORK

.01 The Contractor shall be responsible for the co-ordination of the work of all trades to the end that the combined work shall produce a first class result, without delays.

.02 The Contractor shall expedite the ordering and delivery of all materials and equipment required. No claims will be allowed for delays or additional expenses resulting from failure to place orders in ample time.

.03 The Contractor shall arrange for regular inspections and a final inspection with the inspector.

.04 The Contractor shall provide notice to the applicable State – ‘Construction Safety Branch’ office with the appropriate ‘notice of construction information’ as required, prior to commencing work.

01226 PROJECT MEETINGS

.01 A pre-construction meeting will be arranged by the Engineer immediately upon award of the Contract. A senior Contractor representative and the designated superintendent shall attend.

.02 The Contractor shall attend job progress meetings as required by the AW Project Manager. These meetings shall be held once a month or more frequently should the AW Project Manager deem necessary. The meetings will be held at the Contractor's site office to discuss the progress of the work. Sub-contractors, suppliers, and others shall be in attendance as requested.

01227 SITE SIGNS AND NOTICES

.01 AW will provide project sign free of charge to the Contractor.

.02 Contractor shall pick up, erect and return signs to and from the designated supplier.

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SCHEDULES

01250 SCHEDULES

.01 Four (4) copies of the Construction Schedules showing the dates for the commencement and the completion of major components of the works shall be prepared by the Contractor and submitted to the Engineer within two (2) weeks after the signing of the Contract.

.02 The schedule shall show in a clear network diagram the proposed progress of all activities for the main items, site developments, structures and sub-trades of the Contract and shall indicate where applicable, the labor, construction crews, plant and equipment to be pieces of equipment to be supplied shall be shown. The schedule shall be predicated on the completion of all the work on or before the date of completion as per contract agreement.

.03 Provide a three (3) week rolling window schedule indicating activities completed during the previous week and those planned for the next two (2) week period. Submission shall be provided to the AW Project Manager no later than 1:00 p.m. of each Friday.

.04 The construction sequence shall be in conformance with the requirements of the project and shall be subject to the approval of the AW Project Manager.

.05 The Contractor shall, at the request of the AW Project Manager supply written evidence, either in the form of a schedule or letter, showing his proposed delivery. The AW Project Manager also reserves the right to request unpriced purchase orders showing with whom the Contractor has placed his orders or contracts, as the case may be.

.06 If, during the course of the work, the time of completion of the Contract is extended, the Construction Schedule shall be corrected to show the revised commencement and completion dates of those parts of the work which are affected. In any event, the schedule shall be revised when directed by the AW Project Manager and the Contractor shall have no claim for extra payment by reason of additional work resulting from such an order.

.07 The review of the Contractors schedule or construction program does not relieve the Contractor of any of his duties and responsibilities under this Contract.

.08 The Contractor shall submit details of proposed site layout for approval prior to mobilizing on site.

01251 SEQUENCE OF CONSTRUCTION

.01 The contractor shall submit a written sequence of construction to the AW Project Manager for Approval, and will be fully responsible for ensuring that sewage pumping is provided continuously during the course of construction. The following is a suggested "sequence of construction":

.02 THE CONTRACTOR WILL NOT BE PERMITTED TO DECOMMISSION AND DEMOLISH ANY PORTION OF THE EXISTING WATER DISTRIBUTION OR WASTEWATER COLLECTION SYSTEM, UNTIL THE NEW FACILITIES ARE FULLY OPERATIONAL.

.03 All operation of the existing water valves will be conducted by the AW's operations staff. Provide a minimum of 72 hours written notice to co-ordinate the construction works with AW's operations staff.

01252 OVERTIME

.01 The AW Project Manager may order the work to proceed on a two or three eight-hour shift basis if he deems this necessary to speed up the work, or he may order any work to be carried out in whole or in part at night, and the Contractor shall have no claim for extra compensation in respect thereof. No work, however, shall be undertaken at night without the consent in writing of the AW Project Manager.

.02 Whenever, in the judgement of the AW Project Manager, it may be necessary or expedient, in order to preserve and maintain traffic over or on any street or road, to do work at night or after or before the regular time of ending or beginning labor, such night or overtime work shall be performed by the Contractor without additional or extra cost to the Owner beyond the price bid for the work.

.03 No Saturday or Sunday work will be permitted, except in the case of emergency, and then only with the written permission of the AW Project Manager and to such extent as he may judge to be necessary.

.04 The Contractor shall, as far as possible, refrain from work on days which are legal holidays recognized by AW. In case he desires to work on any such holiday he shall notify the Engineer in writing at least five (5) days in advance of such holiday that he desires to work, stating these places where said work will be conducted. If the Contractor fails to give such notice in advance of any holiday, such failure shall be considered as an indication that no work requiring the presence of an AW Project Manager or Inspector is to be done by the Contractor on such a holiday.

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SECTION 01300

SUBMITTALS

01300 SUBMITTALS

.01 All submittals generally described below shall be made to the AW Project Manager adequately identified by including a reference to the specification item number or drawing number of which it is made.

01310 SHOP DRAWINGS

.01 For the portion of the work where detailed drawings are to be supplied by the Contractor, six (6) copies of same with specifications, shall be submitted to the AW Project Manager for review. Two (2) copies will be retained by the AW Project Manager.

.02 When submitting shop drawings, the Contractor shall notify the AW Project Manager in writing of all respects in which such drawings differ from the requirements of the Contract.

.03 The Contractor or his sub-contractor shall check and initial all shop drawings before submission in order to intercept any errors or omissions.

.04 Work shall not start until all shop drawings related to the said work have been reviewed by the AW Project Manager. All drawings in use on the job site shall bear the completed AW Project Manager reviewed stamp. Any work done without the AW Project Manager's reviewing such shop drawings shall be solely at the risk of the Contractor.

.05 Review of the Contractor's drawings by the AW Project Manager shall not relieve the Contractor of the correctness thereof, nor from the results arising from any error or omission of details of design. Acceptance of drawings and specifications shall be subject to final approval of the equipment and materials after they have been put in commission, all guarantees have been fulfilled and the general operation of the equipment and materials have been found satisfactory to the AW Project Manager.

.06 Shop Drawings, Manufacturer's Cut Sheets (i.e., Brochure Data Sheets), and Manufacturer's Certifications are to be submitted for the following:

Watermains:

- Watermain Pipe Materials: (ductile iron, steel pipe, copper, polyethylene. polyvinyl chloride, prestressed concrete cylinder pipe)
- Watermain Fittings: (bends, tees, couplings, Restrained Joint Glands, etc.)
- Valves: (gate valves, butterfly valves, valve boxes, air release and vacuum relief valves, pressure reducing valves)

- Water Service Connections: (service pipe materials, tapping saddles, corporation stop, curb stop and box)
- Fire Hydrants
- Water Meters

Wastewater Sewers:
- Wastewater Pipe Materials: (polyethylene. polyvinyl chloride, prestressed concrete cylinder pipe)
- Manholes: (precast concrete, fibreglass)
- Manhole Frames and Covers:
- Manhole Height Adjustments: (bricks, precast modulock rings)
- Valves: (gate valves, air release and vacuum relief valves)

General Shop Drawing Information:
- Listing of Aggregate Suppliers
- Concrete Mix Design Data and name of Supplier
- Asphalt Mix Design Data and name of Supplier
- Cement Stabilized Sand Mix design and name of Supplier
- Mortar Mix Design
- Brick Supplier

Special Construction:
- Dewatering Methods
- Vertical Trench Construction
- Tunnel Construction

Site Restoration Items:
- Location of Waste Disposal Site and Letter of Clearance from Owner.
- Geotextile
- Topsoil
- Hydromulch Seeding Mix Design and name of Supplier
- Sodding

01311 WORKING DRAWINGS

.01 No change to the working drawings and specifications (Shop Drawings) are to be made after they have been accepted by the AW Project Manager.

.02 In the event of alterations or changes being authorized by the AW Project Manager, submit six (6) copies of each of the revised drawings and specifications indicating the changes to the AW Project Manager for review. Four (4) sets will be returned to the Contractor.

01315 SAMPLES

.01 Samples of materials and workmanship shall be provided as required by the AW Project Manager. The Contractor shall bear the expense of providing samples and proper storage as required.

.02 No material used in the work shall be inferior in any way to the material approved.

.03 Approval notwithstanding, the AW Project Manager may reject materials delivered to the site and subsequently found to be unsuitable or unsound.

01325 MAINTENANCE PROGRAMS

.01 Before the Contractor leaves the site, he is required to submit a letter setting out the arrangement he has made for the carrying out of maintenance work up to the end of the period of guaranteed maintenance. This letter shall give a telephone number and address for the receipt of notices relating to maintenance. Unless the Contractor's headquarters are close to the site of the works, he shall be required to make satisfactory arrangements with a local contractor for attending to surface maintenance work, or with the AW site operations staff for the same to be carried out at his cost.

.02 A copy of the Contractor's purchase order on such arrangement shall be provided for the AW Project Manager. Failure of the Contractor to make such arrangements and submit a copy of his purchase order for same to the AW Project Manager may delay processing of the Completion Certificate and accompanying payments. Moreover, in the case of the Contractor's failure to arrange in a satisfactory manner for maintenance work to be carried out, the AW Project Manager shall arrange for it to be done by others at the Contractors cost and expense.

.03 For maintenance work during construction, reference is to be made to the relevant provisions herein and hereinafter on clearing and cleaning up and reinstatement of work.

.04 All newly constructed work shall be carefully protected from damages. No wheeling or walking or placing of heavy loads on it shall be allowed and any portion damaged shall be replaced by the Contractor at his own expense.

.05 Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

.06 All structures shall be protected in a manner satisfactory to the AW Project Manager. Should any parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor

at his own expense and to the satisfaction of the AW Project Manager. If, in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the labor and materials required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein for at least the guarantee period described in the General Conditions of this Contract.

01330 "AS-BUILT" DRAWINGS

.01 The Contractor shall furnish to the AW Project Manager two (2) sets of prints of the as-built drawings. (i.e., one (1) full size set, and one (1) reduced size set 11x17”)

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SECTION 01500

TEMPORARY FACILITIES

01510 TEMPORARY FACILITIES

.01 Provide all temporary facilities as specified in the General Conditions except as amended or extended by other items of this section.

.02 Arrange for necessary permits for temporary utilities, and bear all charges levied for these utilities.

01510 FIELD OFFICES AND SHEDS

.01 The Contractor shall provide and maintain such substantially constructed, weathertight structures as will adequately house and service personnel of the Contractor working on or associated with this project. In addition, he shall furnish and maintain satisfactory weathertight structures with raised floors as may be required to adequately protect those materials stored on the site which might be damaged by the weather.

.02 The locations of the proposed temporary buildings used for construction purposes and the type of buildings to be used shall be acceptable to the AW Project Manager before erection work commences.

.03 Temporary buildings must be kept clean and free from nuisance so as not to become a danger to the adjoining properties or to form grounds for complaints from property owners adjacent to the site.

.04 Further, the Contractor shall furnish and maintain all apparatus and equipment, such as ladders, scaffolds, ramps, runways, temporary stairs, derricks, hoists, elevators, chutes, etc., as required for the proper execution and progress of the work. Such facilities shall be strong and substantial and safe for the purpose for which they are intended, and shall meet all applicable requirements of governing regulations and authorities.

.05 When temporary building facilities are no longer needed in construction, they shall be promptly dismantled, unless otherwise specified or directed, and removed from the site.

.06 The lump sum stated in the Schedule of Quantities and Prices under General shall include full compensation for providing field offices as specified. The cost of long distance calls made by the AW Project Manager shall be reimbursed to the Contractor.

01515 TEMPORARY UTILITIES

.01 All equipment to be operated according to the applicable Labor, Health and Safety Acts.

.02 The Contractor shall provide for the supply of water, electrical power, gas, sanitary facilities, heat and any other temporary services required during construction. He shall be responsible for all fees, permits and charges incurred throughout the construction period.

01535 ROADS

.01 The Contractor shall so conduct his operations on the site of these works that the use of adjacent roads by vehicles employed under this Contract will not endanger public pedestrian and vehicular traffic thereon nor hinder the use thereof.

.02 The Contractor shall clean and maintain the cleanliness of adjacent roads and the property occupied by him from waste material or refuse resulting from his operation to the satisfaction of the AW Project Manager.

.03 Trucks hauling excavated material, cement, sand, stone or other loose material to or from the site shall have their loads trimmed and their bodies shall be tight in order that no spillage of their loads will occur.

.04 In general, the Contractor's truck and equipment operations on all roads shall be governed by the Highway Traffic Act, local traffic ordinances and regulations of the local Fire, Police, and local Municipality Works Department.

.05 Should the Contractor, in the opinion of the AW Project Manager, be negligent in his duties in maintaining proper street cleanliness, the AW Project Manager will take the necessary steps to perform such cleaning and will charge the Contractor all costs therefore.

01545 PROPERTY PROTECTION

.01 Trees, fences, poles, and all other property shall be protected unless their removal is authorized. Any property damage shall be satisfactorily restored by the Contractor.

01546 GUARD RAILS, BARRICADES AND SCAFFOLDING

.01 Provide secure, rigid guard railings and barricades around deep excavations, open shafts, open stairwells, open edges of floors and roofs, and to separated construction work from plant operations when in close proximity. Provide lighting as required for safety.

.02 Provide and maintain scaffolding and ramps.

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SECTION 01550

ENVIRONMENTAL CONTROLS

01550 ENVIRONMENTAL CONTROLS

.01 It is intended that the works proposed be executed in such a manner which, to the fullest possible extent, minimizes any adverse effects on the cultural and natural environment of the project area. The environmental Conditions of Contract stated herein must be complied with in all respects. It is a responsibility of the Contractor that all his personnel be sufficiently instructed so that the work is carried out in a manner consistent with minimizing environmental insult. Contractors are informed that AW may assign full or part-time on-site inspectors whose sole responsibility is to ensure environmental compliance objectives.

.02 Should the Contractor wish to obtain access to the easements by way of other than public streets, or access routes already set out, he shall obtain written permission in a form to be approved by the Engineer, from the property owners involved and shall furnish the Engineer with a copy of such permission. The Contractor shall indemnify and save harmless AW, it's officers and agents from all claims and shall assume all liabilities arising from such permission. All access roads shall be constructed by the Contractor only at locations approved by the AW Project Manager. The cost of additional access shall be the responsibility of the contractor and shall not be considered as extra to the AW.

.03 The Contractor shall exercise extreme care when refuelling machinery. Refuelling and maintenance of equipment shall not be undertaken in or adjacent to watercourses. Suitable fuelling and maintenance areas shall be established and all maintenance and fuelling conducted in these areas. No fuelling of backhoes shall be carried out within 100 feet of any watercourse.

.04 In general, the entire site shall be restored to a state equal or if specified elsewhere to a condition better than existing conditions.

.05 Restoration shall be initiated as soon as backfilling and compaction activities have been completed.

.06 Temporary roads shall be removed as soon as construction activities can permit and the vegetative cover shall be restored to its original condition by replanting of natural cover all as specified herein or indicated on the drawings.

.07 All vehicles and equipment shall be equipped with efficient muffling devices to minimize noise levels in the project area.

.08 The Contractor shall establish and maintain site procedures consistent with the objective that noise from the construction area be minimized and in accordance with local by laws.

.09 In areas where some permanent installations, such as tunnel shafts, are required, other devices such as artificial barriers, berms, etc. shall be used to minimize noise levels.

.10 The Contractor shall take such steps as may be required to prevent dust and mud nuisances resulting from the construction site. Dust control measures shall be carried out at all locations on site or on adjacent roads.

.11 Permitted dust control measures include applications of calcium chloride or water. In general, the use of calcium chloride shall be minimized, particularly in close proximity to watercourses and the use of more frequent water application is encouraged. No chemical means of dust control shall be initiated without prior approval by the Engineer.

.12 The transporting of excessively dusty materials such as cement must be carried out in covered haulage vehicles.

.13 The Contractor shall be responsible for the protection of tops, trunks and roots of existing trees on the project site that are to remain. Existing trees subject to construction damage shall be fenced before any work is started. Wherever possible, do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trunks and cover scars immediately with tree paint such as Tree Wound Dressing.

.14 Where excavating, filling or grading is required within the branch spread of trees that are to remain the work shall be performed as follows:

Trenching - When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunnelled under or around the roots by careful hand digging and without injury to the roots. Any roots over one (1) inch which are damaged, shall be treated immediately with tree paint.

Raising Grades - When the existing grade at tree is below the new finished grade, and fill not exceeding 15 inches is required, clean washed gravel graded from one (1) inch to two (2) inch size shall be placed directly around the tree trunk. The gravel shall extend out from the trunk on all sides to a minimum of 20 inches and finish approximately two (2) inches above the finished grade at tree. Install gravel before earth fill is placed. New earth fill shall not be left in contact with the trunks of trees requiring fill.

Lowering Grades - Trees marked for preservation that are located above proposed grades shall stand on broad rounded mounds and be graded smoothly into the lower level. Exposed or broken roots shall be cut clean and covered with topsoil.

.15 Trees potentially undermined by trench construction shall be braced by approved means, for the period of open trench operations.

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SECTION 01600

MATERIALS AND EQUIPMENT

01600 MATERIALS AND EQUIPMENT

.01 All equipment installed and materials used for work under this Contract shall be new and of the best quality. Used or reconditioned materials or equipment will not be accepted, unless otherwise specified.

.02 The Contractor is responsible of ensuring that all equipment under the Contract complies with the requirements of the Contract, and in particular, with the requirement of the Specifications for equipment and materials and that all suppliers of such equipment, etc., comply with such requirements. Failure on the part of a supplier to comply with such requirements shall not relieve the Contractor of responsibility for ensuring that the requirements of the Contract have been fulfilled.

01610 MATERIAL QUALITY

.01 It shall be the Contractor's responsibility to ensure that all materials supplied under this Contract are compatible with each other unless specified adjacent materials have been specified herein, or shown on the drawings. For example, form oil and curing compounds used shall be compatible to the damp-proofing materials and shop applied paints shall be compatible with the field finish coats.

.02 The Contractor shall be required to correct at his own expense any defective work caused by the non-compatibility of materials.

01620 MATERIALS HANDLING

.01 All materials and equipment shall be protected at all times from weather, dust and dirt by the Contractor both before and after installation. The Contractor shall provide temporary housing for all materials, which may be injured by weather, dust or dirt.

.02 The completeness and integrity of all materials supplied by the Contractor, shall be the responsibility of the Contractor. Such materials as are supplied by AW shall be unloaded and placed in storage by the Contractor at the Contractor's expense. Such materials will be delivered to the site at a location suitable to the supplier. The Contractor shall be responsible for the verification of the completeness, soundness and integrity of the material and upon receipt of such material shall be responsible for the material until it has been incorporated into the project and accepted by AW.

01621 FACILITIES FOR FIELD QUALITY CONTROL

.01 The Contractor shall provide four (4) concrete thermometers for the exclusive use of AW's Project Manager.

.02 The Contractor shall supply boxes for storing and curing and crates for transporting concrete cylinders.

01630 INSPECTION AND REJECTION OF MATERIALS

.01 The materials furnished by the Contractor shall be inspected by AW Project Manager at the time of delivery and at such other time as the AW Project Manager may elect, and materials rejected after delivery shall be replaced by and at the expense of the Contractor. All materials furnished and work done by the Contractor shall also be subject to inspection by the AW Project Manager and defective materials shall be removed from the site of the work and defective work repaired or replaced as directed. Facilities for the handling and inspection of materials and work shall, at all times, be furnished by and at the expense of the Contractor, who shall provide suitable and adequate storage room for materials, during the progress of the work and who shall be responsible for any loss of, or damage to, materials until the final acceptance of the completed work.

01640 STORAGE OF MACHINERY

.01 The Contractor shall be governed by the direction of the AW Project Manager in all matters connected with or concerning the storage of machinery on the site and shall at his own cost and expense shift or remove such machinery, immediately upon notice to do so from the AW Project Manager. Such storage of machinery shall not prevent required travel on the street.

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01700 PROJECT CLOSEOUT

.01 Items under this section shall generally be carried out on completion of the Contract except that where directed or approved by the AW Project Manager they may proceed during the project.

01701 LEAKAGE TESTS

.01 All work constructed or installed under this Contract shall be watertight.

.02 Leakage tests for Watermains shall be carried out in accordance with Specification 02515 – Hydrostatic Testing Of Pipelines.

.03 Leakage tests for Gravity Sewers and Sanitary Sewer Forcemains shall be carried out in accordance with Specification 02533 – Acceptance Testing For Sanitary Sewers, and Specification 02515 – Hydrostatic Testing Of Pipelines.

.04 In the event that the leakage test must be repeated due to leakage of the structure or mains, water for the additional tests shall be supplied at the sole expense of the Contractor.

.05 All sewers, piping, watermains, and other equipment, valves and sluice gates shall meet the leakage tests specified in their respective sections.

.06 For new concrete construction, each item shall be tested to the overflow level and any visible leaks stopped by an approved method. After these leaks are stopped, leakage tests shall be conducted by measuring the fall of water level in the tanks over a 24-hour period. Allowable leakage shall be less than one-tenth of one per cent per day of the volume contained.

.07 For units exceeding the allowable leakage, all defects shall be repaired by approved methods and as directed by the AW Project Manager. Tests shall be repeated until the leakage is less than the stipulated amount. If the specified minimum leakage cannot be attained, the AW Project Manager reserves the right to assess a penalty of his own valuation for water loss in excess of the allowable leakage.

01702 CLEANING AND DISINFECTION

.01 The Contractor shall supply all labor, materials and equipment, including the chlorine and water necessary for cleaning and disinfection at his own expense.

.04 Disinfection of watermains shall be carried in accordance with Specification 02514 – Disinfection Of Water Lines.

.05 In the event the water tested is not approved; the Contractor shall repeat the above procedures until water samples meet with approval. All costs will be borne by the Contractor.

01710 CLEANUP

.01 For the duration of the construction period and on completion of the Contract, the Contractor shall remove all equipment, surplus material, debris and rubbish from the site to the approval of the AW Project Manager.

.02 On or before the completion of the work, except as otherwise specifically directed in writing, the Contractor shall remove all temporary buildings and structures built by him and all construction materials and debris from the site of the Contract. The Contractor shall remove and acceptably disinfect all materials containing organic matter, in, under and around buildings used by him and rubbish of all kinds from any ground which he shall have occupied and shall leave the site in a neat and satisfactory condition.

.03 The Contractor shall re-erect all fences that are disturbed, in a suitable manner to ensure their stability, and to the approval of the AW Project Manager.

.04 The Contractor shall satisfactorily check all pipes for their proper support and water tightness and for cleanliness of their interiors.

.05 The Contractor shall ensure that all equipment is properly operating and satisfactorily calibrated for the service intended and left in a perfectly clean condition.

.06 The Contractor shall, upon verbal and/or written notice, take immediate steps to repair or make good settlement or defects in the surfaces of backfilled trenches which appear during the period of guaranteed maintenance, or until assumed by AW.

.07 Should settlement or defects which are, in the opinion of the AW Project Manager, of a dangerous character, develop along the line of work during the guaranteed period, and require immediate repair, the Owner reserves the right of supplying any necessary labor and material to be charged to the Contractor and to be deducted from any monies due or to become due to him without first notifying the Contractor of these defects. The AW Project Manager will, however, immediately notify the Contractor upon completion of such repairs, indicating the cost thereof.

.08 All buildings, walks, fences, pavements, curbs, gutters, driveways, boulevards, conduits, or transmission lines, which suffer damage due to settlement of any trench or excavation, during the guaranteed period, shall be repaired by the Contractor at his own expense.

.09 All culverts, curbs, private sidewalks, and driveways, which are broken, injured or disturbed in the execution of this Contract, are to be restored to their original condition by the Contractor at his own expense.

.10 All debris, rubbish and scrap pieces resulting from cleanup operations shall become the property of the Contractor and shall be removed from the site in such a manner as to create no nuisance in the streets nor to the adjoining property owners.

.11 No debris or other material shall be burned without written approval of the Engineer and all necessary permits.

01717 EQUIPMENT OPERATION & MAINTENANCE MANUAL

.01 The submission of the Operation and Maintenance Manuals by the General Contractor among other requirements, is a prerequisite for the issuance of the Substantial Completion Certificate by the AW Project Manager.

.02 It is the responsibility of the AW Project Manager to ensure that the requirement of this Section be complied with in all respect at the time of the submission of the Operation and Maintenance Manual by the General Contractor.

.03 The General Contractor shall be required to prepare and submit four (4) copies of documentation, including "As-Constructed" shop drawings, for the operation and associated maintenance of each piece of equipment and system as supplied and installed.

.04 The General Contractor shall be required to submit the documentation in 8 1/2 x 11 inch BLACK binders ACCO #05426, hot stamped in white lettering on front and spine to accommodate the documentation in accordance with the following division:

VOLUME 1 OPERATION MANUAL
VOLUME 2 ARCHITECTURAL/STRUCTURAL
VOLUME 3 MECHANICAL OPERATIONS AND MAINTENANCE
VOLUME 4 ELECTRICAL AND INSTRUMENTATION OPERATION

The number of volumes shall be increased and renumbered as necessary to accommodate the documentation. Each copy shall be permanently numbered 1 to 4.

.05 The spine of the binder shall be lettered with the full identification title of the project e.g.

PROJECT NAME
FORT NAME
CONTRACT DESCRIPTION

OPERATION AND MAINTENANCE MANUAL

Volume No. of

and the front face lettered with the following on the respective binders e.g.

PROJECT NAME
FORT NAME

OPERATION & MAINTENANCE MANUAL

CONTRACT: Insert Number

VOLUME No. OF

.06 The binder shall be arranged in accordance with the Construction Specifications Institute Masterformat - Master List of Sections, Titles and Numbers utilizing laminated mylar plastic divider tabs and color coded accordance to Chapter. Color shall be as follows:

i.)	Division	White
ii.)	Systems	Orange
iii.)	Certification & Testing	Green
iv.)	Shop Drawings and Maintenance Bulletins	Yellow
v.)	Safety & Maintenance	Red

.07 VOLUME I

i.) LIST OF SUB-CONTRACTORS
ii.) LIST OF SUPPLIERS
iii.) LIST OF MAINTENANCE MATERIALS
iv.) WARRANTIES
v.) PERFORMANCE TEST REPORTS
vi.) OPERATIONAL TEST REPORTS
vii.) MANUFACTURER'S INSTALLATION AND STARTUP CERTIFICATES

.08 VOLUME 2, 3 & 4

i.) DETAILED TECHNICAL INFORMATION OF EQUIPMENT
ii.) OPERATION AND MAINTENANCE OF EQUIPMENT
iii.) SHOP DRAWING OF EQUIPMENT

.09 For each system and/or equipment, each piece of equipment shall be referred by its tag number and where manufacturer's literature covers several models or options, the

applicable information shall be highlighted or redundant information crossed out and the required information shall be submitted as follows:

i.) Index of information in that Chapter in order of appearance
ii.) Description of system, components and technical data. Include interfaces, sequences, operational characteristic changes for seasonal operation.
iii.) Maintenance and operating instructions.
iv.) Recommended spare parts list.
v.) Schematics, single line, and wiring diagram.
vi.) Service representatives - names, address, telephone and fax number.
vii.) Suppliers for replacement parts - name, address, telephone and fax number.
viii.) Test results and witness testing commissioning test results.
ix.) Certification, guarantee and warranty.
x.) Trouble shooting data.
xi.) Preventative maintenance program complete with suggested checklist sheets.
xii.) Test data of degreasing and flushing of piping.
xiii.) Hydrostatic or air tests performance.
xiv.) Equipment alignment certificates.
xv.) Balancing data for air and water system.
xvi.) Equipment tag list.
xvii.) Inspection approval certificates for all types of systems i.e. plumbing and piping, heating and ventilation, electrical, building etc.

.10 Each binder shall be made up as follows:

I. Tab: Table of Contents -details the titles of various divisions of the included divider tabs.

II. Tab: Introduction to Manual - provide written explanation of the layout of the manual and intended use. Include separately the name, address, telephone and fax number of the following:

a) Consultant (Engineering Firm)
b) General Contractor
c) Sub-Contractors
d) Distributors
e) Manufacturers

.11 The General Contractor is required to submit the Operation and Maintenance Manuals two weeks from the date of the proposed start up of the first piece of equipment or system installed by him.

.12 The AW Project Manager shall not schedule any equipment or system start up with staff unless AW requirements have been fully satisfied.

SECTION 02082

PRECAST CONCRETE MANHOLES

PART I GENERAL

.01 SECTION INCLUDES

A. Precast concrete manholes for sanitary sewers, storm sewers, and water lines.

B. Precast concrete sanitary sewer manholes with PVC liner where indicated in Drawings.

.02 REFERENCES

A. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings

B. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile

C. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

D. ASTM C 270 - Standard Specification for Mortar for Unit Masonry

E. ASTM C 443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

F. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections

G. ASTM C 923 - Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

H. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

I. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3)

J. ASTM D 2665 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

K. ASTM D 2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-FiberReinforced Thermosetting-Resin) Pipe

L. ASTM D 2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-FiberReinforced Thermosetting Resin) Pipe

M. AWWA C 213 - Standard for Fusion Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines

N. American Association of State Highway and Transportation Officials (AASHTO)

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturer's data and details of following items for approval:

1. Shop drawings of manhole sections, base units and construction details, including reinforcement, jointing methods, materials and dimensions.
2. Summary of criteria used in manhole design including, as minimum, material properties, loadings, load combinations, and dimensions assumed. Include certification from manufacturer that precast manhole design is in full accordance with ASTM C 478 and design criteria as established in Paragraph 2.01E of this Specification.
3. Frames, grates, rings, and covers
4. Materials to be used in fabricating drop connections
5. Materials to be used for pipe connections at manhole walls
6. Materials to be used for stubs and stub plugs, if required
7. Materials and procedures for corrosion-resistant liner and coatings, if required.
8. Plugs to be used for sanitary sewer hydrostatic testing
9. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches

C. Seal submittal drawings by a Professional Engineer registered in the state where the project is being completed.

PART2 PRODUCTS

.01 PRECAST CONCRETE MANHOLES

A. Provide manhole sections, base sections, and related components conforming to ASTM C 478. Provide base riser section with integral floors, unless shown otherwise. Provide adjustment rings which are standard components of manufacturer of manhole sections. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.

B. Construct barrels for precast manholes from standard reinforced concrete manhole sections of diameter indicated on Drawings. Use various lengths of manhole sections in combination to provide correct height with fewest joints. Design wall sections for depth and loading conditions in Paragraph 2.01 E, with minimum thickness of 5 inches. Base section shall have minimum thickness of 12 inches under invert.

C. Provide tops to support AASHTO HS-20 vehicle loading, and receive cast iron frame covers, as indicated on Drawings.

D. Where manholes larger than 48-inch diameter are indicated on Drawings, provide precast base sections with flat slab top precast sections used to transition to

48-inch diameter manhole access riser sections. Transition can be concentric or eccentric unless otherwise shown on Drawings. Locate transition to provide minimum of 7-foot head clearance from base to underside of transition unless otherwise approved by Contracting Officer.

E. Design Loading Criteria: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed, by manufacturer, to requirements of ASTM C 478 for depth as shown on Drawings and to resist following loads.

1. AASHTO HS-20 vehicle loading applied to manhole cover and transmitted down to transition and base slabs
2. Unit soil weight of 120 pcf located above portions of manhole, including base slab projections
3. Lateral soil pressure based on saturated soil conditions producing an at-rest equivalent fluid pressure of 100 pcf
4. Internal liquid pressure based on unit weight of 63 pcf
5. Dead load of manhole sections fully supported by transition and base slabs

F. Design: Manhole walls, transition slabs, cone tops, and manhole base slab shall be designed according to requirements of ASTM C 478 and following:

1. Design additional reinforcing steel to transfer stresses at openings. Area of steel to be no less than shown on Drawings.
2. Wall loading conditions:
   a. Saturated soil pressure acting on empty manhole
   b. Manhole filled with liquid to a halfway depth as measured from invert to cover, with no balancing external soil pressure
3. Minimum clear distance between two wall penetrations shall be 12 inches or half diameter of smaller penetration, whichever is greater

G. Provide joints between sections with o-ring gaskets conforming to ASTM C 443.

H. When base is cast monolithic with portion of vertical section, extend reinforcing in vertical section into base.

I. Precast Concrete Base: Suitable cutouts or holes to receive pipe and connections. Lowest edge of holes or cutouts: For water line manhole, no less than 6 inches above inside surface of floor of base.

.02 CONCRETE

A. Conform to requirements of Section 03315- Concrete for Utility Construction.

B. Channel Inverts: Use 5 sack premix (bag) concrete or Class A concrete for inverts not integrally formed with manhole base, with minimum compressive strength of 4000 psi.

C. Concrete Foundation: Provide Class A concrete with minimum compressive strength of 4000 psi for concrete foundation slab under manhole base section where indicated on Drawings.

.03 REINFORCING STEEL

A. Conform to requirements of Section 03315 - Concrete for Utility Construction.

.04 MORTAR

A. Conform to requirements of Section 04061 - Mortar.

.05 MISCELLANEOUS METALS

A. Provide cast-iron frames, rings, and covers conforming to requirements of Section 02084 - Frames, Grates, Rings and Covers.

.06 DROP CONNECTIONS AND STUBS

A. Provide drop connections and stubs conforming to same pipe material requirements used in main pipe, unless otherwise indicated on Drawings.

.07 PIPE CONNECTIONS TO MANHOLE

A. Sanitary Sewers.

1. Provide resilient connectors conforming to requirements of ASTM C 923. Use the following materials for metallic mechanical devices as defined in ASTM C 923:

   1. External clamps: Type 304 stainless steel

      a. Internal, expandable clamps on standard manholes: Type 304 stainless steel, 11 gauge minimum.

      b. Internal, expandable clamps on corrosion-resistant manholes:

      1) Type 316 stainless steel, 11 gauge minimum

      2) Type 304 stainless steel, 11 gauge minimum, coated with minimum 16 mil fusion bonded epoxy conforming to AWWA C 213

2. Where rigid joints between pipe and cast-in-place manhole base are specified or shown on Drawings, provide polyethylene-isoprene water-stop meeting physical property requirements of ASTM C 923, such as Press-Seal WS Series, or approved equal.

B. Storm Sewer Connections:

1. Provide watertight connections in accordance with ASTM C 923.

C. Water Lines

1. Where smooth exterior pipes, i.e., steel, ductile iron, or PVC pipes are connected to manhole base or barrel, seal space between pipe and manhole wall with

assembly consisting of rubber gasket or links mechanically compressed to form a watertight barrier. Assemblies: Press-Wedge, Res-Seal, Thunderline Link-Seal, or approved equal. See Drawings for placement of assembly in manhole sections.

2. When connecting concrete or cement mortar coated steel pipes, or as option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of a stainless steel power sleeve, stainless steel take-up clamp and a rubber gasket. Take-up clamp: Minimum of 9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

.08 SEALANT MATERIALS

A. Approved products in accordance with Section 01300 - Submittal Procedures.

B. Provide sealing materials between precast concrete adjustment ring and manhole cover frame, Adeka Ultraseal P201, or approved equal.

C. Provide approved external sealing material from Canusa Wrapid Seal manhole encapsulation system, or approved equal.

D. Provide Butyl Sealant: Provide Press-Seal EZ Stick, or equal, for HDPE rings.

.09 CORROSION RESISTANT MANHOLE MATERIALS

A. Where corrosion-resistant manholes or PVC-lined manholes are indicated on Drawings, provide the following:

PVC liner for precast cylindrical manhole section, base sections, and cone sections in accordance with Section 02427 - Plastic Liner for Large-Diameter Concrete Sewers and Structures.

.010 BACKFILL MATERIALS

A. Conform to requirements of Section 02317 - Excavation and Backfill for Utilities.

.011 NON-SHRINK GROUT

A. Provide prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only addition of water.

B. Meet requirements of ASTM C 1107 and have minimum 28-day compressive strength of 7000 psi.

.012 VENT PIPES

A. Provide external vent pipes for manholes where indicated on Drawings.

B. Buried Vent Pipes: Provide 3 inch or 4 inch PVC DWV pipe conforming to ASTM D 2665. Alternatively, provide FRP pipe as specified for vent outlet assembly.

C. Vent Outlet Assembly: Provide vent outlet assembly as shown on Drawings, constructed of following specified materials:

1. FRP Pipe: Provide filament wound FRP conforming to ASTM D 2996 or centrifugally cast FRP conforming to ASTM D 2997. Seal cut ends in accordance with manufacturer's recommendations.

2. Joints and Fittings: Provide epoxy bodied fittings and join pipe to fittings with epoxy adhesive

3. Flanges: Provide socket-flange fittings for epoxy adhesive bonding to pipe ends where shown on Drawings. Meet bolt pattern and dimensions for ASME B 16.1, 125-pound flanges. Flange bolts shall be Type 304 stainless steel or hot-dip zinc coated, conforming to ASTM A 307, Class A or B.

4. Coating: Provide approved 2-component, aliphatic polyurethane coating using primer or tie coat recommended by manufacturer. Provide two or more coats to yield dry film thickness of at least 3 mils. Color shall be selected by Project Manager from manufacturer's standard colors.

.013 PROHIBITTED MATERIALS

A. Do not use brick masonry for construction of sanitary sewer manholes, including adjustment of manholes to grade. Use only specified materials listed above.

.014 MANHOLE LADDER FOR WATERLINE MANHOLES

A. Manhole Ladder: Fiberglass with 300-lb rating at appropriate length; conform to requirements of Occupational Safety and Health Standards (OSHA), U.S. Department of Labor except where shown on Drawings

1. Use components, including rungs, made of fiberglass, fabricated with nylon or aluminum rivets and/or epoxy. Apply non-skid coating to ladder rungs. Mount ladder using manufacturer's recommended hardware.

2. Provide ladder as manufactured by Saf-Rail or approved equal. Locate ladder as shown on Drawings.

3. Fiberglass: Premium type polyester resin, reinforced with fiberglass; constructed to provide complete wetting of glass by resin; resistant to rot, fungi, bacterial growth and adverse effects of acids, alkalis and residential and industrial waste; yellow in color.

B. Provide approved petroleum-based tape encapsulating bolts in access manhole.

PART3 EXECUTION

.01 EXAMINATION

A. Verify that lines and grades are correct.

B. Determine if subgrade, when scarified and recompacted, can be compacted to 95 percent of maximum Standard Proctor Density according to ASTM D 698 prior to placement of foundation material and base section. When proper density is not reached, moisture condition subgrade until that density is reached or treat as unstable subgrade.

C. Do not build manholes in ditches, swales, or drainage paths unless approved by Contracting Officer.

.02 PLACEMENT

A. Install precast manholes to conform to locations and dimensions shown on Drawings.

B. Place sanitary and storm manholes at points of change in alignment, grade, size, pipe intersections, and end of sewer unless otherwise shown on Drawings.

.03 MANHOLE BASE SECTIONS AND FOUNDATIONS

A. Place precast base on 12 inch thick (minimum) foundation of crushed stone wrapped in filter fabric, or concrete foundation slab.

B. Unstable Subgrade Treatment: When unstable subgrade is encountered, notify Contracting Officer for examination of subgrade to determine if subgrade has heaved upwards after being excavated. When heaving has not occurred, over-excavate subgrade to allow for 24inch-thick layer of crushed stone wrapped in filter fabric as foundation material under manhole base.

.04 PRECAST MANHOLE SECTIONS

A. Install sections, joints, and gaskets in accordance with manufacturer's printed recommendations.

B. Install precast adjustment rings above tops of cones or flat-top sections as required to adjust finished elevation and to support manhole frame.

C. Seal any lifting holes with non-shrink grout.

D. Where PVC liners are required, seal joints between sections in accordance with manufacturer's recommendations.

E. Place at least two precast concrete grade rings with thickness of 12 inches or less, under casting.

.05 PIPE CONNECTIONS AT MANHOLES

A. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

1. Where smooth exterior pipes, i.e. steel, ductile iron or PVC pipes are connected to manhole base or barrel, space between pipe and manhole wall shall be sealed

with an assembly consisting of rubber gaskets or links mechanically compressed to form watertight barrier. Assemblies: "Press-Wedge," "Res-Seal," "Thunderline Link-Seals," or approved equal. See Drawings for placement of assembly in manhole sections.

2. When connecting concrete or cement mortar coated steel pipes, or as an option for connecting smooth exterior pipes to manhole base or barrel, space between pipe and manhole wall may be sealed with an assembly consisting of stainless steel power sleeve, stainless steel take-up clamp and rubber gasket. Take-up clamp: Minimum of 9/16 inch wide. Provide PSX positive seal gasket system by Press-Seal Gasket Corporation or approved equal.

B. Grout storm sewer connections to manhole unless otherwise shown on Drawings. Grout pipe penetration in place on both inside and outside of manhole.

C. Ensure no concrete, cement stabilized sand, fill, or other rigid material is allowed to enter space between pipe and edge of wall opening at and around resilient connector on either interior or exterior of manhole. If necessary, fill space with compressible material to ensure full flexibility provided by resilient connector.

D. Where new manhole is constructed on existing sewer, rigid joint pipe may be used. Install waterstop gasket around existing pipe at center of cast-in-place wall. Join ends of split waterstop material at pipe springline using an adhesive recommended and supplied by waterstop manufacturer.

E. Test connection for watertight seal before backfilling.

.06 INVERTS FOR SANITARY SEWERS

A. Construct invert channels to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to following criteria:

1. Slope of invert bench: 1 inch per foot minimum; 1-1/2 inches per foot maximum
2. Depth of bench to invert:
   a. Pipes smaller than 15 inches: one-half of largest pipe diameter
   b. Pipes 15 to 24 inches: three-fourths of largest pipe diameter
   c. Pipes larger than 24 inches: equal to largest pipe diameter
3. Invert slope through manhole: 0.10 foot drop across manhole with smooth transition of invert through manhole, unless otherwise indicated on Drawings.

B. Form invert channels with concrete if not integral with manhole base section. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.

.07 DROP CONNECTIONS FOR SANITARY SEWERS

A. Backfill drop assembly with crushed stone wrapped in filter fabric or Class A concrete to form solid mass. Extend cement stabilized sand or concrete encasement minimum of 4 inches outside bells.

B. Install drop connection when sewer line enters manhole higher than 24 inches above invert of manhole.

.08 STUBS FOR FUTURE CONNECTIONS

A. In manholes, where future connections are indicated on Drawings, install resilient connectors and pipe stubs with approved watertight plugs.

.09 MANHOLE FRAME AND ADJUSTMENT RINGS

A. Combine precast concrete or HDPE adjustment rings so elevation of installed casting cover matches pavement surface. Seal between concrete adjustment ring and precast top section with non-shrink grout; do not use mortar between adjustment rings. Apply latex-based bonding agent to precast concrete surfaces joined with non-shrink grout. Set cast iron frame on adjustment ring in bed of approved sealant material. Install sealant bed consisting of two beads of sealant, each bead having minimum dimensions of 1/2-inch and 1/2-inch wide.

B. Wrap manhole frame and adjustment rings with external sealing material, minimum 3 inches beyond joint between ring and frame and adjustment rings and precast section.

C. For manholes in unpaved areas, set top of frame minimum of 6 inches above existing ground line unless otherwise indicated on Drawings. In unpaved areas, encase manhole frame in mortar or non-shrink grout placed flush with face of manhole ring and top edge of frame. Provide rounded corner around perimeter.

.010 BACKFILL

A. Place and compact backfill materials in area of excavation surrounding manholes in accordance with requirements of Section 02317 - Excavation and Backfill for Utilities.

B. Where rigid joints are used for connecting existing sewers to manhole, backfill existing sewer up to springline of pipe with Class B concrete or flowable fill.

C. In unpaved areas, provide positive drainage away from manhole frame to natural grade. Provide minimum of 4 inches of topsoil conforming to requirements of Section 02911 - Topsoil. Seed in accordance with Section 02921 - Hydromulch Seeding. When shown on Drawings, sod disturbed areas in accordance with Section 02922 - Sodding.

.011 FIELD QUALITY CONTROL

A. Conduct leakage testing of sanitary sewer manholes in accordance with requirements of Section 02533 - Acceptance Testing for Sanitary Sewers.

.012 PROTECTION

A. Protect manholes from damage until work has been accepted. Repair damage to manholes at no additional cost to Government.

END OF SECTION

SECTION 02084

FRAMES, GRATES, RINGS, AND COVERS

PART I GENERAL

.01 SECTION INCLUDES

A. Iron castings for manhole frames and covers, inlet frames and grates, catch basin frames and grates, meter vault frames and covers, adjustment rings, and extensions.

B. Ring grates.

.02 REFERENCES

A. AASHTO - American Association of State Highway and Transportation Officials Standard Specification for Highway Bridges

B. ASTM A 48 - Standard Specification for Gray Iron Castings

C. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

D. AWS - D 12.1 Welding Reinforcing Steel.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions.

C. Submit shop drawings for fabrication and installation of casting assemblies that are not included in Drawings or standard details. Include plans, elevations, sections and connection details. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.

PART 2 PRODUCTS

.01 CASTINGS

A. Use castings for frames, grates, rings and covers conforming to ASTM A 48, Class 35B. Provide locking covers where indicated on Drawings.

B. Use clean castings capable of withstanding application of AASHTO M306-40,000 pound proof loading without detrimental permanent deformation.

C. Fabricate castings to conform to shapes, dimensions, and with wording or logos shown on Drawings. Standard dimensions for manhole covers are 32 inches in diameter, unless indicated otherwise.

D. Use clean castings, free from blowholes and other surface imperfections. Use clean and symmetrical cast holes in covers, free of plugs.

.02 BEARING SURFACES

A. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

.03 SPECIAL FRAMES AND COVERS

A. Where indicated on Drawings, provide watertight manhole frames and covers with minimum of four bolts and gasket designed to seal cover to frame. Supply approved watertight manhole covers and frames.

.04 FINISH

A. Unless otherwise specified, uncoated cast iron.

..05 ADJUSTMENT RINGS FOR ASPHALT OVERLAYS

A. Use castings conforming Section 2.01.

B. One piece casting with dimensions to fit frame and cover.

PART 3 EXECUTION

.01 INSTALLATION

A. Install castings according to approved shop drawings, instructions in related specifications, and applicable directions from manufacturer's printed materials.

B. Set castings accurately at required locations to proper alignment and elevation. Keep castings plumb, level, true, and free of rack. Measure location accurately from established lines and grades. Brace or anchor frames temporarily in form work until permanently set.

C. Install adjustment rings in existing frames with clean bearing surfaces that are free from rocking.

END OF SECTION

SECTION 02085

VALVE BOXES, METER BOXES, AND METER VAULTS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Valve boxes for water service.

B. Meter boxes for water service.

C. Meter vaults for water service.

.02 REFERENCES

A. ASTM A 48 - Standard Specification for Gray Iron Castings.

B. ASTM D 256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

C. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

D. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

E. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

F. ASTM D 2240 - Standard Test Method for Rubber Property-Durometer Hardness.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturers' product data for following items for approval:

1. Each type of valve box and lid.
2. Each type of meter box and cover.
3. Each type of meter vault frame and cover.

C. Submit design calculations and shop drawings for precast vault elements, sealed by an Engineer registered in the State where the projet is to be completed.

D. Submit shop drawings for cast-in-place meter vaults for approval if proposed construction varies from Drawings.

PART 2 PRODUCTS

.01 VALVE BOXES

A. Provide approved Type A, cast-iron/ductile-iron, slide-type, valve boxes. Design of valve box shall minimize stresses on valve imposed by loads on box lid.

B. Cast letter "W' into lid, 1/2 inch in height and raised 3/32 inch, for valves serving potable water lines.

C. Unless otherwise specified, uncoated cast iron.

D. Riser Pipe.

1. 6-inch ductile-iron, thickness Class 51 riser pipes in accordance with Section 02501 - Ductile Iron Pipe and Fittings.
2. Provide single section of pipe.

E. Concrete for valve box placement:

1. For locations in new concrete pavement, provide strength and mix design of new pavement.
2. For other locations, provide concrete for sidewalks conforming to requirements of Section 02751 - Concrete Paving.

.02 METER BOXES

A. Provide meter boxes for 5/8-inch through 1-inch meters of the following materials:

1. Non-traffic bearing locations: Cast iron, concrete or plastic.
2. Traffic bearing locations: Cast iron.

B. Provide meter boxes for 1 1/2-inch and 2-inch meters of cast iron.

C. Provide meter box with reading lid. Provide lids with spring-type latching devices. Lids shall contain sufficient metal that meter box can be easily located with metal detector. Cast words "WATER METER" into lid with letters of 1/2-inch height and raised 3/32 inch.

D. Meter box dimensions shall conform to the following approximate dimensions:

1. Length: At top -- 15 1/2 inches; at bottom 20 inches
2. Width: At top - 12 1/2 inches; at bottom 14 3/4 inches
3. Height: 12 inches

E. Extensions: Meter box extensions 3 inches and 6 inches in height shall be available from manufacturer as standard item.

.03 CAST-IRON METER BOXES

A. Cast-Iron Boxes: Clean and free from sand blow-holes or other defects conforming to requirements of ASTM A 48, Class 30B. Bearing surfaces shall be machined so that covers seat evenly in frames.

B. Boxes and lids shall have dipped, coal-tar-pitch, varnish finish.

C. Provide lock-type meter boxes when required by Drawings. Lock mechanisms shall work with ease.

.04 CONCRETE METER BOXES

A. Concrete Meter Boxes: Made of Class A concrete, with minimum 4000 psi compressive strength. Construct to dimensions shown on Drawings.

B. Castings: Free from fractures, large or deep cracks, blisters or surface roughness or any other defects that may affect serviceability.

.05 PLASTIC METER BOXES

A. Plastic Meter Boxes: Made of high density polyethylene conforming to the following ASTM standards:

ASTM	REQUIREMENT
D 256	Impact Strength = 1.9 ft.-lb./inch (Izod, Notched)
D 256	Impact Strength = 6.4 ft.-lb./inch (Izod, Un-Notched)
D 638	Tensile Strength (2.0 min.) = 3400 psi
D 648	Deflection Temperature = 170 degrees F
D 2240	Shore D, Hardness, 55-65 Impact Strength, Falling Dart Method, 160 inch-lb.
D 790	Flexural Modulus = 90,000 psi

B. Meter boxes shall meet the following test requirements:

1. Static Load: Not less than 2500 pounds using 6-inch disc with direct compression exerted at center of top of meter box with solid plastic lid.
2. Deflection: Not less than 1000 pounds load required to deflect top edge of meter box 1/8- inch.

C. Meter box body, without lid, shall weigh approximately 7 pounds.

.06 METER VAULTS

A. Meter vaults may be constructed of precast concrete, or cast-in-place concrete unless a specific type of construction is required by Drawings.

B. Concrete for Meter Vaults: Class A concrete, conforming to requirements of Section 03315 - Concrete for Utility Construction with minimum compressive strength of 4000 psi at 28 days.

C. Reinforcing steel for meter vaults: Conform to requirements of Concrete for Utility Construction.

D. Grates and Covers: Conform to requirements of Section 02084 - Frames, Grates, Rings, and Covers.

PART 3 EXECUTION

.01 EXAMINATION

A. Obtain approval from Contracting Officer for location of meter vault.

B. Verify lines and grade are correct.

C. Verify compacted subgrade will support loads imposed by vaults.

.02 VALVE BOXES

A. Install riser pipe with suitable length for depth of cover indicated on Drawings or to accommodate actual finish grade.

1. Install with bell on top of valve
2. Place riser pipe in plumb, vertical position

B. Install valve box and riser piping plumbed in a vertical position. Provide 6-inches telescoping freeboard space between riser pipe top butt end, and interior contact flange of valve box, for vertical movement damping. End of pipe resting on valve shall be notched out sufficiently to provide a snug fit around the valve bonnet and to center valve inside of pipe.

C. Set, align, and adjust valve box so that lid is level with final grade.

D. Paint covers of new valve boxes in fluorescent orange when installed. After completion and acceptance by Contracting Officer, repaint covers black.

.03 METER BOXES

A. Install cast iron or plastic boxes in accordance with manufacturer's instructions.

B. Construct concrete meter boxes to dimensions shown on Drawings.

C. Adjust top of meter boxes to conform to cover elevations specified in Paragraph 3.05, Frame and Cover for Meter Vaults, below.

D. Do not locate under paved areas unless approved by Contracting Officer. Use approved traffic type box with cast iron lid when meter must be located in paved areas.

.04 METER VAULTS

A. Construct concrete meter vaults to dimensions shown on Drawings. Do not cast in presence of water. Make bottom uniform. Verify lines and grades are correct and compacted subgrade will support loads imposed by vaults.

B. Precast Meter Vaults:

1. Install precast vaults in accordance with manufacturer's recommendations. Set level on a minimum 3-inch-thick bed of sand conforming to requirements of Section 02320 - Utility Backfill Materials.

2. Seal lifting holes with non-shrink grout.

C. Meter Vault Floor Slab:

1. Construct floor slabs of 6-inch-thick reinforced concrete. Slope floor 1/4 inch per foot toward sump. Make sump 12 inches in diameter, or 12 inches square, and 4 inches deep, unless other dimensions are required by Drawings. Install dowels at maximum of 18 inches, center-to-center for keying walls to floor slab.

2. Precast floor slab elements may be used for precast vault construction.

D. Cast-in-Place Meter Vault Walls:

1. Key walls to floor slab and form to dimensions shown on Drawings. Minimum wall thickness shall be 4 inches.

2. Cast walls monolithically. One cold joint will be allowed when vault depth exceeds 12 feet.

3. Set frame for cover in concrete.

.05 FRAME AND COVER FOR METER VAULTS

A. Set cast iron frame in a mortar bed and adjust elevation of cover as follows:

1. In unpaved areas, set top of meter box or meter vault cover 2 to 3 inches above natural grade.

2. In paved areas, set top of meter box or meter vault cover flush with adjacent concrete but no higher than 1/2-inch.

.06 BACKFILL

A. Provide bank run sand in accordance with Section 02320 - Utility Backfill Materials and backfill and compact in accordance with Section 02317 - Excavation and Backfill for Utilities.

B. In unpaved areas, slope backfill around meter boxes and vaults to provide a uniform slope from top to natural grade.

C. In paved areas, slope concrete down from meter box or vault to meet adjacent paved area.

END OF SECTION

SECTION 02086

ADJUSTING MANHOLES, INLETS, AND VALVE BOXES TO GRADE

PART 1 GENERAL

.01 SECTION INCLUDES

A. Adjusting elevation of manholes, inlets, and valve boxes to new grades.

PART 2 PRODUCTS

.01 CONCRETE MATERIALS

A. Provide concrete, conforming to requirements of Section 03315 - Concrete for Utility Construction.

B. Provide precast concrete manhole sections and adjustment rings conforming to requirements of Section 02082 - Precast Concrete Manholes.

C. Provide mortar conforming to requirements of Section 04061 - Mortar.

.02 CAST-IRON MATERIALS

A. Provide cast-iron materials conforming to requirements of Section 02084 - Frames, Grates, Rings, and Covers.

.03 PIPING MATERIALS

A. For riser pipes and fittings, refer to Sections 02501 - Ductile-Iron Pipe and Fittings through 02528 - Polyethylene Wrap.

PART 3 EXECUTION

.01 EXAMINATION

A. Examine existing structure, valve box, frame and cover or inlet box, frame and cover or inlet, piping and connections for damage or defects affecting adjustment to grade. Report damage or defects to Contracting Officer.

.02 ESTABLISHING GRADE

A. Coordinate grade related items with existing grade and finished grade or paving, and relate to established bench mark or reference line.

.03 ADJUSTING MANHOLES AND INLETS

A. Rebuild adjustment portion of manhole or inlet by adding or removing Adjustments. Follow procedures for the type of structure being adjusted detailed in the following Sections:

1. Section 02082 - Precast Concrete Manholes

B. Salvage and reuse cast-iron frame and cover or grate.

C. Protect or block off manhole or inlet bottom using wood forms shaped to fit so that no debris or soil falls to bottom during adjustment.

D. Verify that manholes and inlets are free of visible leaks as result of reconstruction. Repair leaks in manner subject to Contracting Officer's approval.

.04 ADJUSTING VALVE BOXES

A. Salvage and reuse valve box and surrounding concrete block as approved by Contracting Officer.

B. Remove and replace 6 inch ductile iron riser pipe with suitable length for depth of cover required to establish adjusted elevation to accommodate actual finish grade.

C. Reinstall valve box and riser piping plumbed in vertical position. Provide minimum 6 inches telescoping freeboard space between riser pipe top butt end and interior contact flange of valve box for vertical movement damping.

D. After valve box has been set, aligned, and adjusted so that top lid is level with final grade.

.05 BACKFILL AND GRADING

A. Backfill area of excavation surrounding each adjusted manhole, inlet, and valve box and compact according to requirements of Section 02316 - Excavation and Backfill for Structures.

B. Grade ground surface to drain away from each manhole and valve box. Place earth fill around manholes to level of upper rim of manhole frame. Place earth fill around valve box concrete slab.

C. In unpaved areas, grade surface at uniform slope of 1 to 5 from manhole frame to natural grade. Provide minimum of 4 inches of topsoil conforming to requirements of Section 02911 - Topsoil. Provide seeding in accordance with Section 02921 - Hydro-mulch Seeding, or if sodding in accordance with Section 02922 - Sodding.

END OF SECTION

SECTION 02221

REMOVING EXISTING PAVEMENTS AND STRUCTURES

PART 1 GENERAL

.01 SECTION INCLUDES

A. Removing concrete paving, asphaltic concrete pavement, brick pavement and base courses.

B. Removing concrete curbs, concrete curbs and gutters, sidewalks and driveways.

C. Removing pipe culverts, sewers, and sewer leads.

D. Removing existing inlets and manholes.

E. Removing and disposing of pre-stressed concrete beams and drill shafts.

F. Removing miscellaneous structures of concrete or masonry.

G. Removing existing bridge.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for removing and disposing of asphaltic surfacing with or without base, regardless of thickness encountered, shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction.

2. Payment for removing and disposing of reinforced concrete pavement, with or without asphalt overlay, regardless of its thickness, shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction. Payment includes concrete pavement, esplanade curbs, curbs and gutters, and paving headers.

3. Payment for removing and disposing of cement stabilized shell base course, with or without asphaltic surfacing, shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction.

4. Payment for removing and disposing of concrete sidewalks and driveways shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction.

5. Payment for removing asphaltic surface course only shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction. This includes removal of existing surface to pavement base.

6. Payment for removing and disposing of miscellaneous concrete and masonry shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction.

7. Payment for removing and disposing of pipe culverts, sewers, and sewer leads

for each diameter and each material type of pipe removed, shall be included as part of unit price cost for watermain and/or wastewater main (sewer) construction.

8. Payment for removing and disposing of existing inlets is on unit price basis for each inlet removed.
9. Payment for removing and disposing of prestressed concrete piles and drill shafts is on linear foot basis.
10. Payment for removing and disposing of existing bridge, including piles and abutments to minimum of 4 feet below ground level, is on a lump sum basis.
11. Payment for removing and disposing of existing manholes is on unit price basis for each manhole removed.
12. No payment for saw cutting of pavement, curbs, or curbs and gutters will be made under this section. Include cost of such work in unit prices for watermain and/or wastewater main (sewer) construction items listed in bid form requiring saw cutting.
13. No payment will be made for work outside maximum payment limits indicated on Drawings, or for pavements or structures removed for Contractor's convenience.
    a. For utility installations: Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings.
14. Refer to Measurement and Payment for unit price procedures

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate removal work with utility companies.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

.01 PREPARATION

A. Obtain advance approval from the AW Project Manager for dimensions and limits of removal work.

B. Identify known utilities below grade. Stake and flag locations.

.02 PROTECTION

A. Protect following from damage or displacement:

1. Adjacent public and private property.

2. Trees, plants, and other landscape features designated to remain.
3. Utilities designated to remain.
4. Pavement and utility structures designated to remain.
5. Bench marks, monuments, and existing structures designated to remain.

.03 REMOVALS

A. Remove pavements and structures by methods that will not damage underground utilities. Do not use drop hammer near existing underground utilities.

B. Minimize amount of earth loaded during removal operations.

C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to minimum depth of 2 inches.

D. When street and driveway saw cut location is greater than one-half of pavement lane width, remove pavement for full lane width or to nearest longitudinal joint as directed by AW Project Manager.

E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.

F. Where existing end of pipe culvert or end of sewer is to remain, install 8-inch thick masonry plug in pipe end prior to backfill in accordance with requirements of Section 02316 - Excavation and Backfill for Structures.

.04 BACKFILL

A. Backfill of removal areas shall be in accordance with requirements of Section 02316 - Excavation and Backfill for Structures.

.05 DISPOSAL

A. Inlet frames, grates, and plates; and manhole frames and covers, may remain AW property. Disposal shall be in accordance with requirements of AW.

B. Remove from site, debris resulting from work under this section in accordance with requirements of AW.

END OF SECTION

SECTION 02222

ABANDONMENT OF SEWERS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Abandonment in place of existing sewers, junction structures, manholes, and force mains.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for grout fill and abandonment of existing sewers, including boxes and elliptical shaped sewers, is on linear foot basis for each diameter of sewer being abandoned. Measurement will be along centerline of sewer from centerline to centerline of manholes.
2. Payment for grout fill and abandonment of sewer manholes or junction structure is by each manhole or junction structure abandoned in conformance with this Section.
3. Payment will be full compensation for all material, equipment, and labor required for complete abandonment grouting, including air venting, testing, temporary plugs, PVC pipes and incidentals.
4. No separate payment will be made for plugging and abandoning sewer force mains. Include cost of such abandonment in related work.
5. Refer to Measurement and Payment for unit price procedures.
6. Acceptability of grout material is based on achieving average strength within range of 75 to 150 psi as defined in Paragraph 2.01B.1. Grout that is out of range after placement may be accepted with price adjustment of 1.0 percent price deduction for each psi average compressive strength below 75 psi and 0.5 percent price deduction for each psi average compressive strength above 150 psi, as applicable to material volume represented by test series. Shrinkage in grout material placements shall be remedied by Contractor according to Paragraph 3.04H without additional compensation.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 DEFINITIONS

A. Abandonment. Sewer abandonment consists of demolition and removal of portion of manholes existing within specified depth of surface, and abandonment in place of sewer lines and manholes as specified in this Section.

B. Flowable Fill. Flowable fill (abandonment grout) shall be controlled low-strength material consisting of fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in sewer pipes or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. Long-term hardened strength shall be within specified range.

C. Ballast. Large aggregate either replaced with voids subsequently filled with flowable fill injected by grouting method; or in areas with open access, placed individually and sequentially at same time as flowable fill placement.

D. Backgrouting. Secondary stage pressure grouting to ensure that voids have been filled within abandoned sewer. Backgrouting will only be required at critical locations indicated on Drawings or if there is evidence of incomplete flowable fill placements.

.04 REFERENCE STANDARDS

A. ASTM C 150 - Standard Specification for Portland Cement.

B. ASTM C 494 - Standard Specification for Chemical Admixture for Concrete.

C. ASTM C 618 - Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete.

D. ASTM C 937 - Standard Specification for Grout Fluidifier for Pre-placed Aggregate Concrete.

E. ASTM C 940 - Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory.

F. ASTM C 1017 - Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete.

G. ASTM C 1107 - Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

.05 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Flowable fill mix design report:

1. Flowable fill type and production method. Describe if fill will be mixed to fmal proportions and consistency in batch plant or if constituents will be added in transit mixer at placement location.

2. Use of ballast. Provide percentage of ballast of total placement and size limits for ballast if fill is intended to be used with ballast.

3. Aggregate gradation of fill. Aggregate gradation of mix (excluding ballast) shall be used as pilot curve for quality control during production.

4. Fill mix constituents and proportions including materials by weight and volume, and air content but excluding ballast. Give types and amounts of admixtures

including air entrainment or air generating compounds.

5. Fill densities and viscosities, including wet density at point of placement.
6. Initial time of set.
7. Bleeding and shrinkage.
8. Compressive strength.

C. Technical information for equipment and operational procedures including projected slurry injection rate, grout pressure, method of controlling grout pressure, bulkhead and vent design, and number of stages of grout application.

D. Experience record for proposed crew, showing minimum of 100 cubic yards of flowable fill placed using proposed or similar equipment and methods.

E. At least 60 days prior to commencing abandonment activities, submit plan for abandonment, describing proposed grouting sequence, bypass pumping requirements and plugging, if any, and other information pertinent to completion of work.

PART 2 PRODUCTS

.01 FLOWABLE FILL

A. Design Mix Criteria. Provide design of one or more mixes to meet design criteria and conditions for placement. Present information required by Paragraph 1.05.B in mix design report including following:

1. Cement: ASTM C 150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 100 pounds per cubic yard.
2. Fly ash: ASTM C 618 Class C or F. Volume and weight per cubic yard of fill. Provide minimum Fly ash content of 200 pounds per cubic yard.
3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.
4. Aggregate gradation: 100 percent passing 3/8-inch sieve and not more than 10 percent passing No. 200 sieve. Mix design report shall define pilot gradation based on following sieve sizes 3/8-inch, Nos. 4, 8, 16, 30, 50, 100, and 200. Do not deviate from pilot gradation by more than plus or minus 10 percentage points for any sieve for production material.
5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent of natural aggregate to provide workability.
6. Admixtures: Use admixtures meeting ASTM C 494 and ASTM C 1017 as needed to improve pumpability, to control time of set, and reduce bleeding.
7. Fluidifier: Use fluidifier meeting ASTM C 937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.
8. Performance additive: Use flowable fill performance additive, such as Darafill or

approved equal, to control fill properties.

B. Flowable Fill Requirements

1. Unconfined compressive strength: minimum 75 psi and maximum 150 psi at 56 days as determined based on an average of three tests for same placement. Present at least three acceptable strength tests for proposed mix design in mix design report.
2. Placement characteristics: self-leveling.
3. Shrinkage characteristics: non-shrink.
4. Water bleeding for fill to be placed by grouting method in sewers: not to exceed 2 percent according to ASTM C 940.
5. Minimum wet density: 90 pounds per cubic foot.

.02 BALLAST

A. Ballast Material: Natural rock or concrete pieces with minimum size equal to at least 10 times maximum aggregate size of flowable fill and maximum size of 24 inches. Maximum dimension shall not be more than 20 percent of minimum dimension of space to be filled.

B. Ballast Composition: Free of regulated waste material.

.03 PLUGS FOR FORCE MAINS

A. Grout Plugs: Cement-based dry-pack grout conforming to ASTM C 1107, Grade B or C.

B. Manufactured Plug: Commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned.

PART 3 EXECUTION

.01 PREPARATION

A. Have fill mix design reports and other submittals required by Paragraph 1.05 accepted by the AW Project Manager prior to start of placement. Notify the AW Project Manager at least 24 hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not distort or imperil portion of work, new or existing.

C. Clean sewer lines and video with closed circuit television to identify connections, locate obstructions, and assess condition of pipe. Locate previously unidentified connections, which have not been redirected and reconnected as part of this project, and report them to the AW Project Manager. During placement of fill, compensate for irregularities in sewer pipe, such as obstructions, open joints, or broken pipe to ensure no voids remain unfilled.

D. Perform demolition work prior to starting fill placement. Clean placement areas of sewers and manholes of debris that may hinder fill placement. Remove excessive amounts of sludge and other substances that may degrade performance of fill. Do not leave sludge or other debris in place if filling more than 2 percent of placement volume.

E. Remove free water prior to starting fill placement.

.02 EQUIPMENT

A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design.

B. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

.03 DEMOLITION OF SEWER MANHOLES, PIPELINE STRUCTURES, AND FORCE MAINS PRIOR TO ABANDONMENT

A. Remove manhole frames and covers and castings from other existing pipeline structures. Deliver castings to nearest quadrant maintenance facility for future use. Alternatively, salvaged castings may be used upon approval by the AW Project Manager, for constructing new manholes on this project.

B. Demolish and remove precast concrete adjustment rings and corner section, or brick and mortar corbel and chimney, or other pipeline structure, to minimum depth of 4 feet below finished grade. Structure may be removed to greater depth, but not deeper than 18 inches above crown of abandoned sewer.

C. When adjacent sewer lines are not to be filled, place temporary plugs in each line connecting to manhole, in preparation for filling manhole.

D. Excavate overburden from force mains to be abandoned at locations indicated on Drawings, conforming to Section 02317 - Excavation and Backfill for Utilities. Cut existing force main, when necessary, to provide an end surface perpendicular to axis of pipe and suitable for plug to be installed. Remove force main piping material remaining outside of segment to be abandoned.

.04 INSTALLATION

A. Abandon sewer lines by completely filling sewer line with flowable fill. Abandon manholes and other structures by filling with flowable fill, together with ballast as applicable, within depth of structures left in place.

B. Place flowable fill to fill volume between manholes. Continuously place flowable fill from manhole to manhole with no intermediate pour points, but not exceeding 500 feet in length.

C. Have filling operation performed by experienced crews with equipment to monitor density of flowable fill and to control pressure.

D. Temporarily plug sewer lines which are to remain in operation during pouring/pumping to keep lines free of flowable fill.

E. Pump flowable fill through bulkheads constructed for placement of two 2-inch PVC pipes or use other suitable construction methods to contain flowable fill in lines to be abandoned. These pipes will act as injection points or vents for placement of flowable fill.

F. Place flowable fill under pressure flow conditions into properly vented open system until flowable fill emerges from vent pipes. Pump flowable fill with sufficient pressure to overcome friction and to fill sewer from downstream end, to discharge at upstream end.

G. Inject flowable fill through replaced ballast using grouting equipment and series of grout pipes discharging at bottom of placement, allowing fill to rise through ballast effectively filling all voids. Alternatively, sequentially place individual pieces of ballast at same time as flowable fill is placed. Do not fill with ballast more than 50 percent of volume at any level, to prevent nesting and void formation.

H. Remediate placement of flowable fill which does not fill voids in sewer, in manhole or other structures, or where voids develop due to excessive shrinkage or bleeding of fill, by using pressure grouting either from inside sewer or from surface.

I. Plug each end of force main being abandoned.

J. Force main abandonment

1. Clean inside surface of force main at least 12 inches from ends to achieve firm bond and seal grout plug or manufactured plug to pipe surface. Similarly, clean and prepare exterior pipe surface if manufactured cap is to be used.

2. When using grout plug, place temporary plug or bulkhead approximately 12 inches inside pipe. Fill pipe end completely with dry-pack grout mixture.

3. When using manufactured plug or cap, install fitting as recommended by manufacture's instructions, to form water tight seal.

K. Backfill to surface, above pipe or structures left in place, with flowable fill in restricted areas, compacted bank run sand in unrestricted areas to be paved or select fill in unrestricted areas outside of pavement. Place and compact backfill, other than flowable fill, in compliance with Section 02317 - Excavation and Backfill for Utilities.

L. Collect and dispose of excess flowable fill material and other debris in accordance with Waste Material Disposal or as directed by the AW Project Manager.

.05 FIELD QUALITY CONTROL

A. Provide batch plant tickets for each truck delivery of flowable fill. Note on tickets addition of admixtures at site.

B. Check flow characteristics and workability of fill as placement proceeds.

C. Obtain at least three test cylinders for each placement area for determination of 56-day compressive strength and bleeding. Acceptance of placement will be based on average strength of three tests.

D. Record volume of ballast together with flowable fill placement for same space to demonstrate that voids have been filled.

.06 PROTECTION OF PERSONS AND PROPERTY

A. Provide safe working conditions as requied by OSHA and applicable state and local laws for employees throughout demolition and removal operations. Observe safety requirements for work below grade.

B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to work.

END OF SECTION

SECTION 02233

CLEARING AND GRUBBING

PART 1 GENERAL

.01 SECTION INCLUDES

A. Removing surface debris and rubbish.

B. Clearing site of plant life and grass.

C. Removing trees and shrubs.

D. Removing root system of trees and shrubs.

E. Fence removal.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for clearing and grubbing is on per acre basis.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REGULATORY REQUIREMENTS

A. Conform to applicable codes for disposal of debris.

B. Coordinate clearing work with utility companies.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

.01 PREPARATION

A. Verify that existing plant life and features designated to remain are identified and tagged.

.02 PROTECTION

A. Protect following from damage or displacement:

1. Living trees located 3 feet or more outside of intersection of side slopes and original ground line.
2. Plants other than trees and landscape features designated to remain.

3. Utilities designated to remain.
4. Bench marks, monuments, and existing structures designated to remain.

.03 CLEARING

A. Remove stumps, main root ball, and root system to:

1. Depth of 24 inches below finished subgrade elevation in area bounded by lines two feet behind back of curbs.
2. Depth of 24 inches below finished surface of required cross section for other areas.

B. Clear undergrowth and deadwood without disturbing subsoil.

C. Remove vegetation from top soil scheduled for reuse.

.04 REMOVAL

A. Remove debris, rubbish, and extracted plant material life from site.

B. Remove on site fences. Materials generated from removal of fences become property of Contractor. Properly dispose of in accordance with applicable local, state and federal laws.

END OF SECTION

SECTION 02315

ROADWAY EXCAVATION

PART 1 GENERAL

.01 SECTION INCLUDES

A. Excavation and compaction of materials for roadways.

B. Excavation and compaction of materials for roadside ditches.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for roadway excavation shall be included as part of the unit price for watermain and/or wastewater main (sewer) construction.
2. No payment will be made for material excavated under the following conditions:
   a. More than 2 feet outside of vertical planes behind back of curbs
   b. For portion within limits of trench for utilities 24-inch and greater constructed by open-cut methods
   c. As indicated otherwise on Drawings.
3. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12.44 ft-lbf/ft^3).

B. ASTM D 2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

C. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

D. ASTM D 3017 - Standard Test Method for Water content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

E. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

PART 2 PRODUCTS

.01 MATERIALS

A. Provide topsoil conforming to requirements of Section 02911 - Topsoil.

B. Provide backfill which is excavated material, graded free of roots, lumps greater than 6 inches, rocks larger than 3 inches, organic material, and debris.

C. Provide structural backfill which is select material meeting following requirements:

1. Plasticity index: not less than 12 or more than 20.
2. Maximum liquid limit: 45

PART3 EXECUTION

.01 PREPARATION

A. Identify required lines, levels, and datum. Coordinate with Field Surveying.

B. Identify and flag surface and aerial utilities.

C. Notify utility companies to remove or relocate utilities.

D. Identify, stake, and flag known utility locations below grade. Make temporary or permanent relocation of underground pipes, ducts, or utilities where indicated on Drawings.

E. Upon discovery of unknown or badly deteriorated utilities, or concealed conditions, discontinue work. Notify the AW Project Manager and obtain instructions before proceeding in such areas.

F. Obtain approval of topsoil quality before excavating and stockpiling.

.02 PROTECTION

A. Protect following from damage or displacement:

1. Trees, shrubs, lawns, existing structures, and other features outside of grading limits.
2. Utilities either above or below grade, which are to remain.

.03 TOPSOIL REMOVAL

A. Strip off topsoil from area to be excavated to minimum depth of 6 inches, unless indicated otherwise on Drawings.

B. Stockpile topsoil in designated location for reuse. Stockpile topsoil to depth not exceeding 8 feet. Cover to protect from erosion.

.04 SOIL EXCAVATION

A. Excavate to lines and grades shown on Drawings.

B. Remove unsuitable material not meeting specifications. Backfill with embankment materials and compact to specified compaction requirements.

C. Record location and plug and fill inactive water and oil wells. Conform to all local and state requirements. Notify the AW Project Manager prior to plugging wells.

D. At intersections, grade back at minimum slope of one inch per foot. Produce smooth riding junction with intersecting street. Maintain proper drainage.

E. When area is inadvertently over excavated, fill area in accordance with specification requirements at no additional cost to AW.

F. Remove material not qualified for use and excess soil not being reused from site.

.05 COMPACTION

A. Maintain optimum moisture content of subgrade to attain required density.

B. Compact to following minimum densities at moisture content of optimum to 3 percent above optimum as determined by ASTM D 698, unless otherwise indicated on Drawings:

1. Areas under future paving and shoulders: Minimum density of 95 percent of maximum dry density.

2. Other areas: Minimum density of 90 percent of maximum dry density.

.06 TOLERANCES

A. Top of Compacted Surface: Plus or minus 1/2 inch in cross section, or in 16-foot length.

.07 FIELD QUALITY CONTROL

A. Testing will be performed under provisions of Testing Laboratory Services.

B. Test and analysis of soil materials will be performed in accordance with ASTM D 4318, ASTM D 2216, and ASTM D 698.

C. Compaction testing will be performed in accordance with ASTM D 698 or ASTM D 2922 and ASTM D 3017.

D. A minimum of three tests will be taken for each 1000 linear feet per lane of roadway.

E. When tests indicate work does not meet specified compaction requirements, recondition, re-compact, and retest at no additional cost to AW.

.08 PROTECTION

A. Prevent erosion at all times. Maintain ditches and cut temporary swales to allow natural drainage in order to avoid damage to roadway. Do not allow water to pond.

B. Distribute construction traffic evenly over compacted areas, where practical, to aid in obtaining uniform compaction. Protect exposed areas having high moisture content from wheel loads that cause rutting.

C. Maintain excavation and embankment areas until start of subsequent work. Repair and re-compact slides, washouts, settlements, or areas with loss of density.

END OF SECTION

SECTION 02316

EXCAVATION AND BACKFILL FOR STRUCTURES

PART 1 GENERAL

.01 SECTION INCLUDES

A. Excavation, backfilling, and compaction of backfill for structures.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No payment will be made for structural excavation and backfill under this Section. Include payment in unit price or lump sum for construction of structures.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 DEFINITIONS

A. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
3. Materials that contain large clods, aggregates, stones greater than 4 inches in any dimension, debris, vegetation, waste or any other deleterious materials.
4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material: Suitable soil materials are those meeting specification requirements. Unsuitable soils meeting specification requirements for suitable soils after treatment with lime or cement shall be considered suitable, unless otherwise indicated.

C. Select Material: Material as defined in Section 02320 - Utility Backfill Materials.

D. Backfill: Material meeting specified quality requirements, placed and compacted under controlled conditions around structures.

E. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as

backfill where needed to provide stable support for structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

F. Foundation Base: For foundation base material, use crushed stone aggregate with filter fabric as required, cement stabilized sand, or concrete seal slab. Foundation base provides smooth, level working surface for construction of concrete foundation.

G. Foundation Subgrade: Foundation subgrade is surface of natural soil which has been excavated and prepared to support foundation base or foundation backfill, where needed.

H. Ground Water Control Systems: Installations external to excavation such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of excavation, and depressurization to prevent failure or heaving of excavation bottom.

I. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from excavation. Remove rain water and surface water which accidentally enters excavation as part of excavation drainage.

J. Excavation Drainage: Removal of surface and seepage water in excavation by sump pumping and using French drains surrounding foundation to intercept water.

K. Over-Excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below foundation as shown on Drawings, and backfilled with foundation backfill material.

L. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins.

.04 REFERENCES

A. ASTM D 698 - Standard Test Methods for Laboratory Compaction of Soil Using Standard Effort (12,400 ft-lbflft^3 (600kN-mlm^3)).

B. ASTM D 1556 - Standard Test Method for Density of Soil in Place by Sand-Cone Method.

C. ASTM D 2922 - Standard Test Methods for Density of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. ASTM D 3017 - Standard Test Method for Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depths).

E. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

F. Federal Regulations, 29 CFR, Part 1926, Standards - Excavation, Occupational Safety and Health Administration (OSHA).

G. ASTM D 422 Standard Test Method for Particle-Size Analysis of Soils

.05 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit work plan for excavation and backfill for each structure with complete written description which identifies details of proposed method of construction and sequence of operations for construction relative to excavation and backfill activities. Use descriptions, with supporting illustrations, sufficiently detailed to demonstrate to the AW Project Manager that procedures meet requirements of Specifications and Drawings.

C. Submit excavation safety system plan.

1. Submit excavation safety system plan in accordance with applicable OSHA requirements for excavations.

2. Submit excavation safety system plan in accordance with requirements of Trench Safety System, for excavations that fall under State and Federal trench safety laws.

D. Submit ground and surface water control plan in accordance with requirements in this Section.

E. Submit backfill material sources and product quality information in accordance with requirements of Section 02320 - Utility Backfill Materials.

F. Submit project record documents under provisions of Project Record Documents. Record location of utilities, as installed, referenced to survey benchmarks. Include location of utilities encountered or rerouted. Give horizontal dimensions, elevations, inverts and gradients.

.06 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by AW in accordance with requirements of Testing Laboratory Services and as specified in this Section.

B. Perform embedment and backfill material source qualification testing in accordance with requirements of Section 02320 - Utility Backfill Materials.

PART 2 PRODUCTS

.01 EQUIPMENT

A. Perform excavation with equipment suitable for achieving requirements of this Specification.

B. Use equipment which will produce degree of compaction specified. Compact backfill within 3 feet of walls with hand operated equipment. Do not use equipment weighing more than 10,000 pounds closer to walls than a horizontal distance equal to depth of fill at that time. Use hand operated power compaction equipment where use of heavier equipment is impractical or restricted due to weight limitations.

.02 MATERIAL CLASSIFICATIONS

A. Use backfill materials conforming to classifications and product descriptions of Section 02320 - Utility Backfill Materials. Use classification or product description for backfill applications as shown on Drawings and as specified

PART 3 EXECUTION

.01 PREPARATION

A. Conduct an inspection to determine condition of existing structures and other permanent installations.

B. Set up necessary street detours and barricades in preparation for excavation if construction will affect traffic. Conform to requirements of local Traffic Control and Regulation. Maintain barricades and warning devices at all times for streets and intersections where work is in progress, or where affected by Work, and is considered hazardous to traffic movements.

C. Perform work in accordance with OSHA standards. Employ an excavation safety system.

D. Remove existing pavements and structures, including sidewalks and driveways, in accordance with requirements of Section 02221 - Removing Existing Pavements and Structures.

E. Install and operate necessary dewatering and surface water control measures..

.02 PROTECTION

A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.

D. Prevent erosion of excavations and backfill. Do not allow water to pond in excavations.

E. Maintain excavation and backfill areas until start of subsequent work. Repair and recompact slides, washouts, settlements, or areas with loss of density at no additional cost to AW.

.03 EXCAVATION

A. Perform excavation work so that underground structure can be installed to depths and alignments shown on Drawings. Use caution during excavation work to avoid disturbing surrounding ground and existing facilities and improvements. Keep

excavation to absolute minimum necessary. No additional payment will be made for excess excavation not authorized by the AW Project Manager.

B. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify the AW Project Manager and obtain instructions before proceeding in such areas.

C. Immediately notify agency or company owning any line which is damaged, broken or disturbed. Obtain approval from the AW Project Manager and agency for any repairs or relocations, either temporary or permanent.

D. Avoid settlement of surrounding soil due to equipment operations, excavation procedures, vibration, dewatering, or other construction methods.

E. Provide surface drainage during construction to protect work and to avoid nuisance to adjoining property. Where required, provide proper dewatering and piezometric pressure control during construction.

F. Conduct hauling operations so that trucks and other vehicles do not create dirt nuisance in streets. Verify that truck beds are sufficiently tight and loaded in such a manner such that objectionable materials will not spill onto streets. Promptly clear away any dirt, mud, or other materials that spill onto streets or are deposited onto streets by vehicle tires.

G. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed, replace those which are damaged or destroyed by Work.

H. Provide sheeting, shoring, and bracing where required to safely complete Work, to prevent excavation from extending beyond limits indicated on Drawings, and to protect Work and adjacent structures or improvements. Use sheeting, shoring, and bracing to protect workmen and public.

I. Prevent voids from forming outside of sheeting. Immediately fill voids with grout, cement stabilized sand, or other material approved by the AW Project Manager and compact to 95 percent standard density.

J. After completion of structure, remove sheeting, shoring, and bracing unless shown on Drawings to remain in place or directed by the AW Project Manager in writing that such temporary structures may remain. Remove sheeting, shoring and bracing in such a manner as to maintain safety during backfilling operations and to prevent damage to Work and adjacent structures or improvements.

K. Immediately fill and compact voids left or caused by removal of sheeting with cement stabilized sand or other material approved by the AW Project Manager and compact to 95 percent standard density.

.04 HANDLING EXCAVATED MATERIALS

A. Classify excavated materials. Place material which is suitable for use as backfill in orderly piles at sufficient distance from excavation to prevent slides or cave-ins.

B. Provide additional backfill material in accordance with requirements of Section 02319 - Borrow, if adequate quantities of suitable material are not available from excavation and trenching operations at site.

.05 DEWATERING

A. Provide ground water control as required.

B. Keep ground water surface elevation minimum of 2 feet below bottom of foundation base.

C. Maintain ground water control as directed and until structure is sufficiently complete to provide required weight to resist hydrostatic uplift with minimum safety factor of 1.2.

.06 FOUNDATION EXCAVATION

A. Notify the AW Project Manager at least 48 hours prior to planned completion of foundation excavations. Do not place foundation base until excavation is accepted by the AW Project Manager.

B. Excavate to elevations shown on Drawings, as needed to provide space for foundation base, forming level undisturbed surface, free of mud or soft material. Remove pockets of soft or otherwise unstable soils and replace with foundation backfill material or material as directed by the AW Project Manager. Prior to placing material over it, recompact subgrade where indicated on Drawings, scarifying as needed, to 95 percent of maximum Standard Dry Density according to ASTM D 698. If specified level of compaction cannot be achieved, moisture condition subgrade and recompact until 95 percent is achieved, over-excavate to provide minimum layer of 24 inches of foundation backfill material, or other means acceptable to the AW Project Manager.

C. Fill unauthorized excessive excavation with foundation backfill material or other material as directed by the AW Project Manager.

D. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition. Keep excavations free of standing water and completely free of water during concrete placement.

E. Remove soils which become unsuitable due to inadequate dewatering or other causes, after initial excavation to required subgrade, and replace with foundation backfill material, as directed by the AW Project Manager, at no additional cost to AW.

F. Place foundation base, or foundation backfill material where needed, over subgrade on same day that excavation is completed to final grade. Where base of excavations are left open for longer periods, protect them with seal slab or cement-stabilized sand.

G. Use filter fabric as specified in Section 02621 - Geotextile to separate crushed aggregate, and other free draining Class I materials from native soils or select material backfill. Overlap fabric minimum of 12 inches beyond where another

material stops contact with soil. Place crushed aggregate, and other Class I materials, in uniform layers of 8-inch maximum thickness. Perform compaction by means of at least two passes of vibratory compactor.

.07 FOUNDATION BASE.

A. Place foundation base after subgrade is properly prepared, including placement of foundation backfill where needed. Use foundation base consisting of 12-inch layer of crushed stone aggregate or cement stabilized sand. Alternately, seal slab with minimum thickness of 4 inches may be placed. Extend foundation base minimum of 12 inches beyond edge of structure foundation, unless shown otherwise on Drawings.

B. Where foundation base and foundation backfill are of same material, both can be placed in one operation.

.08 BACKFILL

C. Complete backfill to surface of natural ground or to lines and grades shown on Drawings. Remove forms, lumber, trash and debris from structures.

- Unless otherwise shown on the the Drawings, for structures under pavement or within one foot back of curb, use cement stablized sand up to pavement base or subgrade.
- Unless otherwise shown on the Drawings, for structures not under pavement, use cement stablized sand to within 2 feet of final grade. Use random backfill of suitable material for the top two feet.

D. Do not place backfill against concrete walls or similar structures until laboratory test breaks indicate that concrete has reached minimum of 85 percent of specified compressive strength. Where walls are supported by slabs or intermediate walls, do not begin backfill operations until slab or intermediate walls have been placed and concrete has attained sufficient strength.

E. Remove concrete forms before starting backfill and remove shoring and bracing as work progresses.

F. Maintain backfill material at no less than 2 percent below nor more than 2 percent above optimum moisture content, unless otherwise approved by the AW Project Manager. Place fill material in uniform 8-inch maximum loose layers. Compact fill to at least 95 percent of maximum Standard Proctor Density according to ASTM D 698 below paved areas. Compact fill to at least 95 percent around structures below unpaved areas.

G. Where backfill is placed against sloped excavation surface, run compaction equipment across boundary of cut slope and backfill to form compacted slope surface for placement of next layer of backfill.

H. Place backfill using cement stabilized sand in accordance with Section 02321 - Cement Stabilized Sand.

.09 FIELD QUALITY CONTROL

A. Testing will be performed by an independant Testing Laboratory Services firm as retained by AW.

B. Tests will be performed initially on minimum of one different sample of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with ASTM D 422. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity.

C. In-place density tests of compacted subgrade and backfill will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions:

1. Minimum of one test for every 50 to 100 cubic yards of compacted backfill material as directed by the AW Project Manager.
2. A minimum of three density tests for each full work shift.
3. Density tests will be performed in all placement areas.
4. Number of tests will be increased when inspection determines that soil types or moisture contents are not uniform or when compacting effort is variable and not considered sufficient to attain uniform density.
5. Identify elevation of test with respect to natural ground.
6. Record approximate depth of lift tested.

D. At least one test for moisture-density relationships will be initially performed for each type of backfill material in accordance with ASTM D 698. Perform additional moisture-density relationship test once a month or whenever there is noticeable change in material gradation or plasticity.

E. When tests indicate work does not meet specified compaction requirements, recondition, recompact, and retest at Contractor's expense.

.010 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess materials in accordance with requirements of the contract documents.

END OF SECTION

SECTION 02317

EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 GENERAL

.01 SECTION INCLUDES

A. Excavation, trenching, foundation, embedment, and backfill for installation of utilities, including manholes and other pipeline structures.

.02 MEASUREMENT AND PAYMENT

A. A. Unit Prices.

1. No additional payment will be made for trench excavation, embedment and backfill under this Section. Include cost in unit price for installed underground piping, sewer, conduit, or duct work.
2. When AW Project Manager directs Contractor to overexcavate trench bottom, Contractor will be paid by unit price bid per linear foot under bid item - 6" Over excavation of Trench Bottom.
    a. No payment will be paid if AW Project Manager does not direct Contractor to overexcavate trench bottom.
    b. No over excavation will be measured or paid when unsuitable conditions result from dewatering system not in conformance with Control of Ground Water and Surface Water.
3. No additional payment will be made for performing Critical Location exploratory excavation. Include cost for unit price for installed underground piping, sewer, conduit, or duct work.
4. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 DEFINITIONS

A. Pipe Foundation: Suitable and stable native soils that are exposed at trench subgrade after excavation to depth of bottom of bedding as shown on Drawings, or foundation backfill material placed and compacted in over-excavations.

B. Pipe Bedding: Portion of trench backfill that extends vertically from top of foundation up to level line at bottom of pipe, and horizontally from one trench sidewall to opposite sidewall.

C. Haunching: Material placed on either side of pipe from top of bedding up to springline of pipe and horizontally from one trench sidewall to opposite sidewall.

D. Initial Backfill: Portion of trench backfill that extends vertically from springline of pipe (top of haunching) up to level line 12 inches above top of pipe, and horizontally from one trench sidewall to opposite sidewall.

E. Pipe Embedment: Portion of trench backfill that consists of bedding, haunching and initial backfill.

F. Trench Zone: Portion of trench backfill that extends vertically from top of pipe embedment up to pavement subgrade or up to final grade when not beneath pavement.

G. Unsuitable Material: Unsuitable soil materials are the following:

1. Materials that are classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
3. Materials that contain large clods, aggregates, stones greater than 4 inches in any dimension, debris, vegetation, waste or any other deleterious materials.
4. Materials that are contaminated with hydrocarbons or other chemical contaminants.

H. Suitable Material: Suitable soil materials are those meeting specification requirements. Materials mixed with lime, fly ash, or cement that can be compacted to required density and meeting requirements for suitable materials may be considered suitable materials, unless otherwise indicated.

I. Backfill: Suitable material meeting specified quality requirements placed and compacted under controlled conditions.

J. Ground Water Control Systems: Installations external to trench, such as well points, eductors, or deep wells. Ground water control includes dewatering to lower ground water, intercepting seepage which would otherwise emerge from side or bottom of trench excavation, and depressurization to prevent failure or heaving of excavation bottom.

K. Surface Water Control: Diversion and drainage of surface water runoff and rain water away from trench excavation. Rain water and surface water accidentally entering trench shall be controlled and removed as part of excavation drainage.

L. Excavation Drainage: Removal of surface and seepage water in trench by sump pumping and using drainage layer, as defined in ASTM D 2321, placed on foundation beneath pipe bedding or thickened bedding layer of Class I material.

M. Trench Conditions are defined with regard to stability of trench bottom and trench walls of pipe embedment zone. Maintain trench conditions that provide for effective placement and compaction of embedment material directly on or against undisturbed soils or foundation backfill, except where structural trench support is necessary.

1. Dry Stable Trench: Stable and substantially dry trench conditions exist in pipe embedment zone as result of typically dry soils or achieved by ground water

control (dewatering or depressurization) for trenches extending below ground water level.

2. Stable Trench with Seepage: Stable trench in which ground water seepage is controlled by excavation drainage.

    a. Stable Trench with Seepage in Clayey Soils: Excavation drainage is provided in lieu of or to supplement ground water control systems to control seepage and provide stable trench subgrade in predominately clayey soils prior to bedding placement.

    b. Stable Wet Trench in Sandy Soils: Excavation drainage is provided in embedment zone in combination with ground water control in predominately sandy or silty soils.

3. Unstable Trench: Unstable trench conditions exist in pipe embedment zone if ground water inflow or high water content causes soil disturbances, such as sloughing, sliding, boiling, heaving or loss of density.

N. Sub-trench: Sub-trench is special case of benched excavation. Sub-trench excavation below trench shields or shoring installations may be used to allow placement and compaction of foundation or embedment materials directly against undisturbed soils. Depth of sub-trench depends upon trench stability and safety as determined by Contractor.

O. Trench Dam: Placement of low permeability material in pipe embedment zone or foundation to prohibit ground water flow along trench.

P. Over-excavation and Backfill: Excavation of subgrade soils with unsatisfactory bearing capacity or composed of otherwise unsuitable materials below top of foundation as shown on Drawings, and backfilled with foundation backfill material.

Q. Foundation Backfill Materials: Natural soil or manufactured aggregate of controlled gradation, and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill to provide stable support for bedding. Foundation backfill materials may include concrete seal slabs.

R. Trench Safety Systems include both protective systems and shoring systems.

S. Trench Shield (Trench Box): Portable worker safety structure moved along trench as work proceeds, used as protective system and designed to withstand forces imposed on it by cavein, thereby protecting persons within trench. Trench shields may be stacked if so designed or placed in series depending on depth and length of excavation to be protected.

T. Shoring System: Structure that supports sides of an excavation to maintain stable soil conditions and prevent cave-ins, or to prevent movement of ground affecting adjacent installations or improvements.

U. Special Shoring: Shoring system meeting special shoring as specified in Paragraph 1.08, Special Shoring Design Requirements, for locations identified on Drawings.

.04 REFERENCES

A. ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipe Lines.

B. ASTM D 558 - Standard Test Methods for Moisture-Density Relations of Soil Cement Mixtures.

C. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft).

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

E. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

F. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes.

G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

H. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

I. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

J. ASTM D 422 – Standard Test Method for Particle-Size Analysis of Soils

K. Federal Regulations, 29 CFR Part 1926, Standards-Excavation, Occupational Safety and Health Administration (OSHA).

.05 SCHEDULING

A. Schedule work so that pipe embedment can be completed on same day that acceptable foundation has been achieved for each section of pipe installation, manhole, or other structures.

.06 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit planned typical method of excavation, backfill placement and compaction including:

1. Trench widths.
2. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction.
3. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.

C. Submit backfill material sources and product quality information in accordance with requirements of Section 02320 - Utility Backfill Materials.

D. Submit trench excavation safety program. Include designs for special shoring

meeting requirements defined in Paragraph 1.08, Special Shoring Design Requirements contained herein.

E. Submit record of location of utilities as installed, referenced to survey control points. Include locations of utilities encountered or rerouted. Give stations, horizontal dimensions, elevations, inverts, and gradients.

F. Submit 11 inch by 17 inch or 12 inch by 18 inch copy of Drawing with plotted utility or obstruction location titled "Critical Location Report" to AW Project Manager.

.07 TESTS

A. Testing and analysis of backfill materials for soil classification and compaction during construction will be performed by an independent laboratory provided by AW.

B. Perform backfill material source qualification testing in accordance with requirements of Section 02320- Utility Backfill Materials.

.08 SPECIAL SHORING DESIGN REQUIREMENTS

A. Have special shoring designed or selected by Contractor's Professional Engineer registered in the state the project is being completed to provide support for sides of excavations, including soils and hydrostatic ground water pressures as applicable, and to prevent ground movements affecting adjacent installations or improvements such as structures, pavements and utilities. Special shoring may be a premanufactured system selected by Contractor's Professional Engineer to meet project site requirements based on manufacturer's standard design.

PART 2 PRODUCTS

.01 EQUIPMENT

A. Perform excavation with hydraulic excavator or other equipment suitable for achieving requirements of this Section.

B. Use only hand-operated tamping equipment until minimum cover of 12 inches is obtained over pipes, conduits, and ducts. Do not use heavy compacting equipment until adequate cover is attained to prevent damage to pipes, conduits, or ducts.

C. Use trench shields or other protective systems or shoring systems which are designed and operated to achieve placement and compaction of backfill directly against undisturbed native soil.

D. Use special shoring systems where required which may consist of braced sheeting, braced soldier piles and lagging, slide rail systems, or other systems meeting requirements as specified in Paragraph 1.08, Special Shoring Design Requirements.

.02 MATERIAL CLASSIFICATIONS

A. Embedment and Trench Zone Backfill Materials: Conform to classifications and product descriptions of Section 02320 - Utility Backfill Materials, and Section 2321 – Cement Stabilized Sand.

B. Concrete Backfill: Conform to requirements for Class B concrete as specified in Concrete for Utility Construction.

C. Geotextile (Filter Fabric): Conform to requirements of Section 02621-Geotextile.

D. Concrete for Trench Dams: Concrete backfill or 3 sack premixed (bag) concrete.

PART 3 EXECUTION

.01 STANDARD PRACTICE

A. Install flexible pipe, including "semi-rigid" pipe, to conform to standard practice described in ASTM D 2321, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

B. Install rigid pipe to conform to standard practice described in ASTM C 12, and as described in this Section. Where an apparent conflict occurs between standard practice and requirements of this Section, this Section governs.

.02 PREPARATION

A. Maintain barricades and warning lights for streets and intersections affected by Work, and that are considered hazardous to traffic movements.

B. Perform work to conform to applicable safety standards and regulations. Employ trench safety system as specified and as shown on the contract drawings.

C. Immediately notify agency or company owning any existing utility line which is damaged, broken, or disturbed. Obtain approval from AW Project Manager and agency for any repairs or relocations, either temporary or permanent.

D. Remove existing pavements and structures, including sidewalks and driveways, to conform to requirements of Section 02221 - Removing Existing Pavements and Structures, as applicable.

E. Install and operate necessary dewatering and surface-water control measures. Provide stable trench to allow installation in accordance with Specifications.

F. Maintain permanent benchmarks, monumentation, and other reference points. Unless otherwise directed in writing, replace those which are damaged or destroyed in accordance with Field Surveying.

.03 CRITICAL LOCATION INVESTIGATION

A. Horizontal and vertical location of various underground lines shown on Drawings, including but not limited to water lines, gas lines, storm sewers, sanitary sewers, telecommunication lines, electric lines or power ducts, pipelines, concrete and debris, are based on best information available but are only approximate locations. At Critical Locations shown on Drawings, field verify horizontal and vertical locations of such lines within zone 2 feet vertically and 4 feet horizontally of proposed work.

1. Verify location of existing utilities minimum of 7 working days in advance of pipe laying activities based on daily pipe laying rate. Use extreme caution and care when uncovering these lines.

2. Notify AW Project Manager in writing immediately upon identification of obstruction. In event of failure to identify obstruction in minimum of 7 days, Contractor will not be entitled to extra cost for downtime including, but not limited to, payroll, equipment, overhead, demobilization and remobilization, until 7 days has passed from time AW Project Manager is notified of obstruction.

B. Notify involved utility companies of date and time that investigation excavation will occur and request that their respective utility lines be marked in field. Comply with utility or pipeline company requirements that their representative be present during excavation. Provide AW Project Manager with 48 hours notice prior to field excavation or related work.

C. Survey vertical and horizontal locations of obstructions relative to project baseline and datum and plot on 12 inch by 18 inch copy of Drawings. For large diameter water lines, submit to AW Project Manager for approval, horizontal and vertical alignment dimensions for connections to existing lines, tied into project baseline, signed and sealed by R.P.L.S registered in the state the project is being completed.

.04 PROTECTION

A. Protect trees, shrubs, lawns, existing structures, and other permanent objects outside of grading limits and within grading limits as designated on Drawings.

B. Protect and support above-grade and below-grade utilities which are to remain.

C. Restore damaged permanent facilities to pre-construction conditions unless replacement or abandonment of facilities is indicated on Drawings.

D. Take measures to minimize erosion of trenches. Do not allow water to pond in trenches. Where slides, washouts, settlements, or areas with loss of density or pavement failures or potholes occur, repair, recompact, and pave those areas at no additional cost to AW.

.05 EXCAVATION

A. Except as otherwise specified or shown on Drawings, install underground utilities in open cut trenches with vertical sides.

B. Perform excavation work so that pipe, conduit, and ducts can be installed to depths and alignments shown on Drawings. Avoid disturbing surrounding ground and existing facilities and improvements.

C. Determine trench excavation widths using following schedule as related to pipe outside diameter (O.D.).

Nominal Pipe Size, Inches	**Minimum Trench Width, Inches**
Less than 18	O.D. + 18
18 to 30	O.D. + 24
Over 30	O.D.+24

D. Use sufficient trench width or benches above embedment zone for installation of well point headers or manifolds and pumps where depth of trench makes it uneconomical or impractical to pump from surface elevation. Provide sufficient space between shoring cross braces to permit equipment operations and handling of forms, pipe, embedment and backfill, and other materials.

E. Upon discovery of unknown utilities, badly deteriorated utilities not designated for removal, or concealed conditions, discontinue work at that location. Notify AW Project Manager and obtain instructions before proceeding.

F. Shoring of Trench Walls.

1. Install Special Shoring in advance of trench excavation or simultaneously with trench excavation, so that soils within full height of trench excavation walls will remain laterally supported at all times.

2. For all types of shoring, support trench walls in pipe embedment zone throughout installation. Provide trench wall supports sufficiently tight to prevent washing trench wall soil out from behind trench wall support.

3. Leave sheeting driven into or below pipe embedment zone in place to preclude loss of support of foundation and embedment materials, unless otherwise directed by AW Project Manager. Leave rangers, walers, and braces in place as long as required to support sheeting, which has been cut off, and trench wall in vicinity of pipe zone.

4. Employ special methods for maintaining integrity of embedment or foundation material. Before moving supports, place and compact embedment to sufficient depths to provide protection of pipe and stability of trench walls. As supports are moved, finish placing and compacting embedment.

5. If sheeting or other shoring is used below top of pipe embedment zone, do not disturb pipe foundation and embedment materials by subsequent removal. Maximum thickness of removable sheeting extending into embedment zone shall be equivalent

of 1-inch-thick steel plate. As sheeting is removed, fill in voids left with grouting material.

G. Use of Trench Shields. When trench shield (trench box) is used as worker safety device, the following requirements apply:

1. Make trench excavations of sufficient width to allow shield to be lifted or pulled freely, without damage to trench sidewalls.
2. Move trench shields so that pipe, and backfill materials, after placement and compaction, are not damaged nor disturbed, nor degree of compaction reduced. Re-compact after shield is moved if soil is disturbed.
3. When required, place, spread, and compact pipe foundation and bedding materials beneath shield. For backfill above bedding, lift shield as each layer of backfll is placed and spread. Place and compact backfill materials against undisturbed trench walls and foundation.
4. Maintain trench shield in position to allow sampling and testing to be performed in safe manner.
5. Conform to applicable Government regulations.

H. Voids under paving area outside shield caused by Contractor's work will require removal of pavement, consolidation and replacement of pavement in accordance with Contract Documents. Repair damage resulting from failure to provide adequate supports.

I. Place sand or soil behind shoring or trench shield to prevent soil outside shoring from collapsing and causing voids under pavement. Immediately pack suitable material in outside voids following excavation to avoid caving of trench walls.

J. Coordinate excavation within 15 feet of pipeline with company's representative. Support pipeline with methods agreed to by pipeline company's representative. Use small, rubber tired excavator, such as backhoe, to do exploratory excavation. Bucket that is used to dig in close proximity to pipelines shall not have teeth or shall have guard installed over teeth to approximate bucket without teeth. Excavate by hand within 1 foot of Pipeline Company's line. Do not use larger excavation equipment than normally used to dig trench in vicinity of pipeline until pipelines have been uncovered and fully exposed. Do not place large excavation and hauling equipment directly over pipelines unless approved by Pipeline Company's representative.

K. When, during excavation to uncover Pipeline Company's pipelines, screwed collar or an oxyacetylene weld is exposed, immediately notify AW Project Manager. Provide supports for collar or welds. Discuss with Pipeline Company's representative and determine methods of supporting collar or weld during excavation and later backfilling operations. When collar is exposed, request Pipeline Company to provide welder in a timely manner to weld ends of collar prior to backfilling of excavation.

.06 HANDLING EXCAVATED MATERIALS

A. Use only excavated materials, which are suitable as defined in this Section and conforming to Section 02320 - Utility Backfill Materials. Place material suitable for backfilling in stockpiles at distance from trench to prevent slides or cave-ins.

B. When required, provide additional backfill material conforming to requirements of Section 02320 - Utility Backfill Materials.

C. Do not place stockpiles of excess excavated materials on streets and adjacent properties. Protect backfill material to be used on site. Excavate trench so that pipe is centered in trench. Do not obstruct sight distance for vehicles utilizing roadway or detours with stockpiled materials.

.07 TRENCH FOUNDATION

A. Excavate bottom of trench to uniform grade to achieve stable trench conditions and satisfactory compaction of foundation or bedding materials.

B. When wet soil is encountered on trench bottom and dewatering system is not required, overexcavate an additional 6 inches with approval by AW Project Manager. Place non-woven geotextile fabric and then compact 12 inches of crushed stone in one lift on top of fabric. Compact crushed stone with four passes of vibratory-type compaction equipment.

C. Perform over excavation, if directed by AW Project Manager, in accordance with Paragraph 3.07.B above. Removal of material me be required.

1. Even though Contractor has not determined material to be unsuitable, or
2. If unstable trench bottom is encountered and an adequate ground water control system is installed and operating.

D. Place trench dams in Class I foundations in line segments longer than 100 feet between manholes and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

.08 PIPE EMBEDMENT, PLACEMENT, AND COMPACTION

A. Remove loose, sloughing, caving, or otherwise unsuitable soil from bottoms and sidewalls of trenches immediately prior to placement of embedment materials.

B. Place embedment including bedding, haunching, and initial backfill as shown on Drawings.

C. For pipe installation, manually spread embedment materials around pipe to provide uniform bearing and side support when compacted. Protect flexible pipe from damage during placing of pipe zone bedding material. Perform placement and compaction directly against undisturbed soils in trench sidewalls, or against sheeting which is to remain in place.

D. Do not place trench shields or shoring within height of embedment zone unless means to maintain density of compacted embedment material are used. If

moveable supports are used in embedment zone, lift supports incrementally to allow placement and compaction of material against undisturbed soil.

E. Place geotextile to prevent particle migration from in-situ soil into open-graded (Class I) embedment materials or drainage layers.

F. Do not damage coatings or wrappings of pipes during backfilling and compacting operations. When embedding coated or wrapped pipes, do not use crushed stone or other sharp, angular aggregates.

G. Place haunching material manually around pipe and compact it to provide uniform bearing and side support. If necessary, hold small-diameter or lightweight pipe in place during compaction of haunch areas and placement beside pipe with sand bags or other suitable means.

H. Place electrical conduit, if used, directly on foundation without bedding.

I. Shovel in-place and compact embedment material using pneumatic tampers in restricted areas, and vibratory-plate compactors or engine-powered jumping jacks in unrestricted areas. Compact each lift before proceeding with placement of next lift. Water tamping is not allowed.

J. For water lines construction embedment, use bank run sand, concrete sand, gem sand, pea gravel, or crushed limestone as specified in Section 02320 - Utility Backfill Material. For water lines adhere to the following subparagraph numbers 1 and 2; for utility installation other than water, adhere to numbers 3 and 4 below:

1. Class I, II and III Embedment Materials:

    a. Maximum 6 inches compacted lift thickness.

    b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

    c. Moisture content to be within -3 percent to +5 percent of optimum as determined according to ASTM D 698, unless otherwise approved by Project Manager.

2. Cement Stabilized Sand (where required for special installations):

    a. Maximum 6 inches compacted thickness.

    b. Compact to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698.

    c. Moisture content to be on dry side of optimum as determined according to ASTM D 698 but sufficient for effective hydration.

3. Class I Embedment Materials.

    a. Maximum 6-inches compacted lift thickness.

    b. Systematic compaction by at least two passes of vibrating equipment. Increase compaction effort as necessary to effectively embed pipe to meet deflection test criteria.

    c. Moisture content as determined by Contractor for effective compaction without softening soil of trench bottom, foundation or trench walls.

4. Class II Embedment and Cement Stabilized Sand.

    a. Maximum 6-inches compacted thickness.

    b. Compaction by methods determined by Contractor to achieve minimum of 95 percent of maximum dry density as determined according to ASTM D 698 for Class II materials and according to ASTM D 558 for cement stabilized materials.

    c. Moisture content of Class II materials within 3 percent of optimum as determined according to ASTM D 698. Moisture content of cement stabilized sands on dry side of optimum as determined according to ASTM D 558 but sufficient for effective hydration.

K. Place trench dams in Class I embedment in line segments longer than 100 feet between manholes, and not less than one in every 500 feet of pipe placed. Install additional dams as needed to achieve workable construction conditions. Do not place trench dams closer than 5 feet from manholes.

.09 TRENCH ZONE BACKFILL PLACEMENT AND COMPACTION

A. Place backfill for pipe or conduits and restore surface as soon as practicable. Leave only minimum length of trench open as necessary for construction.

B. For water lines, under pavement and to within one (1) foot back of curb, use backfill materials described by trench limits.

1. For water lines 20 inches in diameter and smaller use bank run sand or select backfill materials up to pavement base or subgrade.

2. For water lines 24 inch in diameter and larger, backfill with suitable on-site materials (random backfill) up to 12 inches below pavement base or subgrade. Place minimum of 12 inches of select backfill below pavement base or subgrade.

C. For sewer pipes under pavement and within one foot back of curb, use backfill materials described by trench limits.

- For sewer pipes 36 inches in diameter and smaller use cement stabilized sand up to pavement base or subgrade.
- For sewer pipes 42 inches and larger, backfill with suitable on-site material (random backfill) up to 12 inches below pavement base or subgrade. Place minimum of 12 inches of select backfill below pavement base or subgrade.

D. Where shown on the Drawings, remove unsuitable material from the site and backfill with suitable materials.

E. Unless otherwise shown on the Drawings, use one of the following trench zone backfills under pavement and to within one foot of edge of pavemnt. Place trench zone backfill in lifts and compact. Fully compact each lift before placement of next lift..

1. Class I, II, or III or combination thereof):

    a. Place in maximum 12 inch thick loose layers.

b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 698.

c. Moisture content within zero percent to +5 percent of optimum determined according to ASTM D 698, unless otherwise approved by AW Project Manager.

2. Cement-Stabilized Sand:

a. Maximum lift thickness determined by Contractor to achieve uniform placement and required compaction, but do not exceed 12 inches.

b. Compact by vibratory equipment to minimum of 95 percent of maximum dry density determined according to ASTM D 558.

c. Moisture content on dry side of optimum determined according to ASTM D 558 but sufficient for cement hydration.

3. Class IV A and IV B (Clay Soils):

a. Place in maximum 8-inch thick loose layers.

b. Compact by vibratory Sheepsfoot Roller to minimum of 95 percent of maximum dry density determined according to ASTM D 698.

c. Moisture content within zero percent below or +5 percent above optimum determined according to ASTM D 698, unless approved by Project Manager.

F. Unless otherwise shown on Drawings, for trench excavations not under pavement, random backfill of suitable material may be used in trench zone.

1. Class IV A and Class IV B (Clay Soils) may be used as trench zone backfill outside paved areas.

2. Place in maximum 12-inch loose thick loose lift.

3. Compact to minimum of 90 percent of maximum dry density determined according to ASTM D 698.

4. Moisture content as necessary to achieve density.

G. For electric conduits, remove form work used for construction of conduits before placing trench zone backfill.

.010 MANHOLES, JUNCTION BOXES AND OTHER PIPELINE STRUCTURES

A. Encapsulate manhole, junction box and other pipeline structures with cement stablized sand, minimum one (1) foot below base, minimum one (1) foot around walls, up to within 12 inches of pavement subgrade. Compact in accordance with Paragraph 3.9.F.2 of this Section.

.011 FIELD QUALITY CONTROL

A. Test for material source qualifications as defined in Section 02320 - Utility Backfill Materials.

B. Provide excavation and trench safety systems at locations and to depths required

for testing and retesting during construction at no additional cost to AW.

C. Tests will be performed on minimum of three different samples of each material type for plasticity characteristics, in accordance with ASTM D 4318, and for gradation characteristics, in accordance with ASTM D 422. Additional classification tests will be performed whenever there is noticeable change in material gradation or plasticity, or when requested by AW Project Manager.

D. At least three tests for moisture-density relationships will be performed initially for backfill materials in accordance with ASTM D 698, and for cement- stabilized sand in accordance with ASTM D 558. Perform additional moisture-density relationship tests once a month or whenever there is noticeable change in material gradation or plasticity.

E. In-place density tests of compacted pipe foundation, embedment and trench zone backfill soil materials will be performed according to ASTM D 1556, or ASTM D 2922 and ASTM D 3017, and at following frequencies and conditions.

1. For open cut construction projects and auger pits: Unless otherwise approved by AW Project Manager, successful compaction to be measured by one test per 40 linear feet measured along pipe for compacted embedment and two tests per 40 linear feet measured along pipe for compacted trench zone backfill material. Length of auger pits to be measured to arrive at 40 linear feet.
2. A minimum of three density tests for each full shift of Work.
3. Density tests will be distributed among placement areas. Placement areas are: foundation, bedding, haunching, initial backfill and trench zone.
4. The number of tests will be increased if inspection determines that soil type or moisture content are not uniform or if compacting effort is variable and not considered sufficient to attain uniform density, as specified.
5. Density tests may be performed at various depths below fill surface by pit excavation. Material in previously placed lifts may therefore be subject to acceptance/rejection.
6. Two verification tests will be performed adjacent to in-place tests showing density less than acceptance criteria. Placement will be rejected unless both verification tests show acceptable results.
7. Recompacted placement will be retested at same frequency as first test series, including verification tests.
8. Identify elevation of test with respect to natural ground or pavement.

F. Recondition, recompact, and retest at Contractor's expense if tests indicate Work does not meet specified compaction requirements. For hardened soil cement with nonconforming density, core and test for compressive strength at Contractor's expense.

G. Acceptability of crushed rock compaction will be determined by inspection.

.012 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess materials in accordance with requirements of the contract documents.

END OF SECTION

SECTION 02319

BORROW

PART 1 GENERAL

.01 SECTION INCLUDES

A. Soil materials for embankment.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for borrow is on cubic yard basis calculated by theoretical quantities using average end area method based on Drawings.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM D 2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.

B. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit location and description of proposed borrow area for approval.

C. Submit material samples for testing.

PART 2 PRODUCTS

.01 SOIL MATERIAL

A. Grade borrow material used for embankment free of lumps greater than 6 inches, rocks larger than 3 inches, organic material, chemical waste or other contamination, and debris. Take borrow material from sources approved by AW Project Manager.

B. Use material with plasticity index not less than 12, nor more than 20 when tested in accordance with ASTM D 4318. Maximum liquid limit shall be 45, unless approved by AW Project Manager. Do not use blend of cohesive and granular soils to achieve required plasticity index.

PART 3 EXECUTION

.01 PREPARATION

A. Notify AW Project Manager and testing laboratory 5 days in advance of opening borrow source to permit obtaining samples for qualification testing. When material does not meet specification requirements, locate another source of borrow.

B. Clear approved source area of trees, stumps, brush, roots, vegetation, organic matter, and other unacceptable material before excavation.

.02 TESTS

A. Test and analyze soil materials in accordance with ASTM D 4318 and ASTM D 2216.

.03 EXCAVATION

A. Provide adequate drainage of surface water so that surface water run off does not enter borrow pit excavation.

.04 HAULING

A. Use covered trucks.

END OF SECTION

SECTION 02320

UTILITY BACKFILL MATERIALS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Material Classifications.

B. Utility Backfill Materials: 1) Concrete sand 2) Gem sand 3) Pea gravel 4) Crushed stone 5) Crushed concrete 6) Bank run sand 7) Select backfill 8) Random backfill

C. Material Handling and Quality Control Requirements.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No payment will be made for backfill material. Include payment in unit price for applicable utility installation.
2. Payment for backfill material, when included as separate pay item or when directed by AW Project Manager, is on cubic yard basis for material placed and compacted within theoretical trench width limits and thickness of material according to Drawings, or as directed by AW Project Manager.
3. Payment for backfill of authorized over-excavation is in accordance with Section 02318 - Extra Unit Price Work for Excavation and Backfill.
4. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 DEFINITIONS

A. Unsuitable Material:

1. Materials classified as ML, CL-ML, MH, PT, OH, and OL according to ASTM D 2487.
2. Materials that cannot be compacted to required density due to gradation, plasticity, or moisture content.
3. Materials containing large clods, aggregates, or stones greater than 4 inches in any dimension; debris, vegetation, or waste; or any other deleterious materials.
4. Materials contaminated with hydrocarbons or other chemical contaminants.

B. Suitable Material:

1. Materials meeting specification requirements.

2. Unsuitable materials meeting specification requirements for suitable soils after treatment with lime or cement.

C. Foundation Backfill Materials: Natural soil or manufactured aggregate meeting Class I requirements and geotextile filter fabrics as required, to control drainage and material separation. Foundation backfill material is placed and compacted as backfill where needed to provide stable support for structure foundation base. Foundation backfill materials may include concrete fill and seal slabs.

D. Foundation Base: Crushed stone aggregate with filter fabric as required, cement stabilized sand, or concrete seal slab. Foundation base provides smooth, level working surface for construction of concrete foundation.

E. Backfill Material: Classified soil material meeting specified quality requirements for designated application as embedment or trench zone backfill.

F. Embedment Material: Soil material placed under controlled conditions within embedment zone extending vertically upward from top of foundation to an elevation 12 inches above top of pipe, and including pipe bedding, haunching and initial backfill.

G. Trench Zone Backfill: Classified soil material meeting specified quality requirements and placed under controlled conditions in trench zone from top of embedment zone to base course in paved areas or to surface grading material in unpaved areas.

H. Foundation: Either suitable soil of trench bottom or material placed as backfill of overexcavation for removal and replacement of unsuitable or otherwise unstable soils.

I. Source: Source selected by Contractor for supply of embedment or trench zone backfill material. Selected source may be project excavation, off site borrow pits, commercial borrow pits, or sand and aggregate production or manufacturing plants.

J. Refer to Section 02317 - Excavation and Backfill for Utilities for other definitions regarding utility installation by trench construction.

.04 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregate.

B. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

C. ASTM C 123 - Standard Test Method for Lightweight Particles in Aggregate.

D. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine.

E. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

F. ASTM C 142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregates.

G. ASTM D 1140 - Standard Test Method for Amount of Material in Soils Finer Than No. 200 Sieve.

H. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

I. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

J. ASTM D 4643 - Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.

.05 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit description of source, material classification and product description, production method, and application of backfill materials.

C. Submit test results for samples of off-site backfill materials. Comply with Paragraph 2.03, Material Testing.

D. Before stockpiling materials, submit copy of approval from landowner for stockpiling backfill material on private property.

E. Provide delivery ticket which includes source location for each delivery of material that is obtained from off site sources or is being paid as specific bid item.

.06 TESTS

A. Perform tests of sources for backfill material in accordance with Paragraph 2.03B.

B. Verification tests of backfill materials may be performed by AW in accordance with Paragraph 3.03.

PART 2 PRODUCTS

.01 MATERIAL CLASSIFICATIONS

A. Classify materials for backfill for purpose of quality control in accordance with Unified Soil Classification Symbols as defined in ASTM D 2487. Material use and application is defined in utility installation specifications and Drawings either by class, as described in Paragraph 2.01 B, or by product descriptions, as given in Paragraph 2.02.

B. Class Designations Based on Laboratory Testing:

1. Class I: Well-graded gravels and sands, gravel-sand mixtures, crushed well-graded rock, little or no fines (GW, SW):

    a. Plasticity index: non-plastic.

    b. Gradation: D60/D10 - greater than 4 percent; amount passing No. 200 sieve - less than or equal to 5 percent.

2. Class II: Poorly graded gravels and sands, silty gravels and sands, little to moderate fines (GM, GP, SP, SM):
    a. Plasticity index: non-plastic to 4.
    b. Gradations:
        1) Gradation (GP, SP): amount passing No. 200 sieve - less than 5 percent.
        2) Gradation (GM, SM): amount passing No. 200 sieve - between 12 percent and 50 percent.
        3) Borderline gradations with dual classifications (e.g., SP-SM): amount passing No. 200 sieve - between 5 percent and 12 percent.
3. Class III: Clayey gravels and sands, poorly graded mixtures of gravel, sand, silt, and clay (GC, SC, and dual classifications, e.g., SP-SC):
    a. Plasticity index: greater than 7.
    b. Gradation: amount passing No. 200 sieve - between 12 percent and 50 percent.
4. Class IVA: Lean clays (CL).
    a. Plasticity Indexes:
        1) Plasticity index: greater than 7, and above A line.
        2) Borderline plasticity with dual classifications (CL-ML): PI between 4 and 7.
    b. Liquid limit: less than 50.
    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
    d. Inorganic.
5. Class IVB: Fat clays (CH)
    a. Plasticity index: above A line.
    b. Liquid limit: 50 or greater.
    c. Gradation: amount passing No. 200 sieve - greater than 50 percent.
    d. Inorganic.
6. Use soils with dual class designation according to ASTM D 2487, and which are not defined above, according to more restrictive class.

.02 PRODUCT DESCRIPTIONS

A. Soils classified as silt (ML) silty clay (CL-ML with PI of 4 to 7), elastic silt (MH), organic clay and organic silt (OL, OH), and organic matter (PT) are not acceptable as backfill materials. These soils may be used for site grading and restoration in unimproved areas as approved by AW Project Manager. Soils in Class IV B, fat clay (CH) may be used as backfill materials where allowed by applicable backfill installation specification. Refer to Section 02316 - Excavation and Backfill for Structures and Section 02317 - Excavation and Backfill for Utilities.

B. Provide backfill material that is free of stones greater than 6 inches, free of roots, waste, debris, trash, organic material, unstable material, non-soil matter, hydrocarbon or other contamination, conforming to following limits for deleterious materials:

1. Clay lumps: Less than 0.5 percent for Class I, and less than 2.0 percent for Class II, when tested in accordance with ASTM C 142.
2. Lightweight pieces: Less than 5 percent when tested in accordance with ASTM C 123.
3. Organic impurities: No color darker than standard color when tested in accordance with ASTM C 40.

C. Manufactured materials, such as crushed concrete, may be substituted for natural soil or rock products where indicated in product specification, and approved by AW Project Manager, provided that physical property criteria are determined to be satisfactory by testing.

D. Bank Run Sand: Durable bank run sand classified as SP, SW, or SM by Unified Soil Classification System (ASTM D 2487) meeting following requirements:

1. Less than 15 percent passing number 200 sieve when tested in accordance with ASTM D 1140. Amount of clay lumps or balls may not exceed 2 percent.
2. Material passing number 40 sieve shall meet the following requirements when tested in accordance with ASTM D 4318: Plasticity index: not exceeding 7.

E. Concrete Sand: Natural sand, manufactured sand, or combination of natural and manufactured sand conforming to requirements of ASTM C 33 and graded within following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

F. Gem Sand: Sand conforming to requirements of ASTM C 33 for course aggregates specified for number 8 size and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
3/8"	95 to 100
No. 4	60 to 80
No. 8	15 to 40

G. Pea Gravel: Durable particles composed of small, smooth, rounded stones or pebbles and graded within the following limits when tested in accordance with ASTM C 136:

Sieve	Percent Passing
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

H. Crushed Aggregates: Crushed aggregates consist of durable particles obtained from an approved source and meeting the following requirements:

1. Materials of one product delivered for same construction activity from single source, unless otherwise approved by AW Project Manager.
2. Non-plastic fines.
3. Los Angeles abrasion test wear not exceeding 45 percent when tested in accordance with ASTM C 131.
4. Crushed aggregate shall have minimum of 90 percent of particles retained on No. 4 sieve with 2 or more crushed faces.
5. Crushed stone: Produced from oversize plant processed stone or gravel, sized by crushing to predominantly angular particles from naturally occurring single source. Uncrushed gravel is not acceptable materials for embedment where crushed stone is shown on applicable utility embedment drawing details.
6. Crushed Concrete: Crushed concrete is an acceptable substitute for crushed stone as utility backfill. Gradation and quality control test requirements are same as crushed stone. Provide crushed concrete produced from normal weight concrete of uniform quality; containing particles of aggregate and cement material, free from other substances such as asphalt, reinforcing steel fragments, soil, waste gypsum (calcium sulfate), or debris.
7. Gradations, as follows:

Sieve	Percent Passing by Weight for Pipe Embedment by Ranges of Nominal Pipes Sizes		
	>15"	15" - 8"	< 8"
1"	95 - 100	100	
3/4"	60- 90	90 - 100	100
1/2"	25- 60	-	90 - 100
3/8"	-	20 - 55	40- 70
No.4	0- 5	0-10	0-15
No. 8	-	0- 5	0- 5

I. Select Backfill: Class III clayey gravel or sand or Class IV lean clay with plasticity index between 7 and 20 or clayey soils treated with lime in accordance with Section 02951 - Pavement Repair and Resurfacing, to meet plasticity criteria.

J. Random Backfill: Any suitable soil or mixture of soils within Classes I, II, III and IV; or fat clay (CH) where allowed by applicable backfill installation specification. Refer to Section 02316 - Excavation and Backfill for Structures and Section 02317 - Excavation and Backfill for Utilities.

K. Cement Stabilized Sand: Conform to requirements of Section 02321 - Cement Stabilized Sand.

L. Concrete Backfill: Conform to Class B concrete as specified in Section 03315 - Concrete for Utility Construction.

M. Flexible Base Course Material: Conform to requirements of applicable portions of Section 02711 - Hot Mix Asphaltic Base Course, Section 02712 - Cement Stabilized Base Course.

.03 MATERIAL TESTING

A. Source Qualification. Perform testing to obtain tests by suppliers for selection of material sources and products not from the project site. Test samples of processed materials from current production representing material to be delivered. Use tests to verify that materials meet specification requirements. Repeat qualification test procedures each time source characteristics change or there is planned change in source location or supplier. Include the following qualification tests, as applicable:

1. Gradation. Report complete sieve analyses regardless of specified control sieves from largest particle through No. 200 sieve.
2. Plasticity of material passing No. 40 sieve
3. Los Angeles abrasion wear of material retained on No. 4 sieve
4. Clay lumps
5. Lightweight pieces

6. Organic impurities

B. Production Testing. Provide reports to AW Project Manager from an independent testing laboratory that backfill materials to be placed in Work meet applicable specification requirements.

C. Assist AW Project Manager in obtaining material samples for verification testing at source or at production plant.

PART 3 EXECUTION

.01 SOURCES

A. Use of existing material in trench excavations is acceptable, provided applicable specification requirements are satisfied.

B. Identify off-site sources for backfill materials at least 14 days ahead of intended use so that AW Project Manager may obtain samples for verification testing.

C. Materials may be subjected to inspection or additional verification testing after delivery. Materials which do not meet requirements of specifications will be rejected. Do not use material which, after approval, has become unsuitable for use due to segregation, mixing with other materials, or by contamination. Once material is approved by AW Project Manager, expense for sampling and testing required to change to different material will be credited to AW through change order.

D. Bank ran sand, select backfill, and random backfill, if available in project excavation, may be obtained by selective excavation and acceptance testing. Obtain additional quantities of these materials and other materials required to complete work from off-site sources.

E. AW does not represent or guarantee that any soil found in excavation work will be suitable and acceptable as backfill material.

.02 MATERIAL HANDLING

A. When backfill material is obtained from either commercial or non-commercial borrow pit, open pit to expose vertical faces of various strata for identification and selection of approved material to be used. Excavate selected material by vertical cuts extending through exposed strata to achieve uniformity in product.

B. Establish temporary stockpile locations for practical material handling, control, and verification testing by AW Project Manager in advance of final placement. Obtain approval from landowner for storage of backfill material on adjacent private property.

C. When stockpiling backfill material near project site, use appropriate covers to eliminate blowing of materials into adjacent areas and prevent runoff containing sediments from entering drainage system.

D. Place stockpiles in layers to avoid segregation of processed materials. Load material by making successive vertical cuts through entire depth of stockpile.

.03 FIELD QUALITY CONTROL

A. Quality Control

1. The AW Project Manager may sample and test backfill at:

    a. Sources including borrow pits, production plants and Contractor's designated off-site stockpiles.

    b. On-site stockpiles.

    c. Materials placed in Work.

2. The AW Project Manager may re-sample material at any stage of work or location if changes in characteristics are apparent.

B. Production Verification Testing: AW's testing laboratory will provide verification testing on backfill materials, as directed by AW Project Manager. Samples may be taken at source or at production plant, as applicable.

END OF SECTION

SECTION 02427

PLASTIC LINER FOR LARGE-DIAMETER CONCRETE SEWERS AND STRUCTURES

PART 1 GENERAL

.01 SECTION INCLUDES

A. Installation of plastic liners for concrete interceptor sewers and structures. Only plastic liners manufactured with integral locking ribs spaced at approximately 2-1/2 inches on center over entire liner is acceptable. Liners relying on mechanically fastened batten strips as primary means of anchorage are unacceptable.

.02 REFERENCE STANDARDS

A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubber and Thermoplastic Elastomers-Tension.

B. ASTM D 2440 - Standard Test Methods for Oxidation Stability of Mineral Insulating Oil.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Prior to submittal of shop drawings, manufacturer shall approve proposed panel layout and proposed details. Contractor shall then submit shop drawings showing proposed panel layout to cover area to be lined. Show on shop drawings proposed details for installation of liner at seams, terminations, corners, openings, pipe penetrations, etc., and type of factory and field welds and attachments.

C. Provide sufficient details to permit placement of liner without use of design Drawings. Reproduction of design Drawings for use as shop drawings will not be allowed. Do not begin fabrication of liner until after shop drawings and submitted materials have been reviewed and accepted by Contracting Officer.

.04 INSTALLER QUALIFICATIONS

A. Applicators. Application of plastic liner to forms and other surfaces, liner finishing, repair, and testing is considered highly specialized work and shall be performed only by firms and individuals recommended and approved by lining manufacturer. Personnel performing such work are to be trained in methods of installation and demonstrate their ability to AW Project Manager.

B. Welders.

1. Each welder is to pass qualification welding test before doing welding. Requalification may be required at time deemed necessary by Contracting Officer. Provide at least 24 hours notice to Contracting Officer to schedule qualification welding test.
2. Make test welds in presence of Contracting Officer. Test welds are to consist of following:
    a. Begin with two pieces of liner, at least 15 inches long and 9 inches wide. Hold pieces in vertical position, lapped 1-1/2 inches.
    b. Position weld strip over edge of lap and weld to both pieces of liner. Extend each end of weld strip at least 2 inches beyond liner to provide tabs.
3. The weld specimen will be tested as follows:
    a. Subject each weld strip tab, tested separately, to 10-pound pull normal to face of liner with liner secured firmly in place. Weld is acceptable when there is no separation between weld strip and liner.
    b. Cut three test specimens from welded sample and tested in tension across welds. Tensile strength measured across welded joints is to be at least 2000 psi when tested in accordance with ASTM D 412. When none of these specimens fails when tested as indicated above, weld will be considered satisfactory.
    c. If one specimen fails to pass tension test, retest will be permitted. Retest consists of testing three additional specimens cut from original welded sample. When three retest specimens pass test, weld will be considered satisfactory.
4. A disqualified welder may submit new weld sample when welder has had sufficient off-the-job training or experience to warrant re-examination.

PART 2 PRODUCTS

.01 MANUFACTURERS

A. Plastic liner shall be as manufactured by Ameron Protective Linings Division; Poly-Tee, Inc.; or approved equal.

.02 MATERIALS

A. Manufacturing.

1. Manufacture plastic liner sheet, joint, corner and weld strips from high molecular weight thermoplastic polymer compounded to make permanently flexible material suitable for use as protective liner in concrete pipe or other concrete structures. Polyvinyl chloride resin is to constitute not less than 99 percent by weight of resin used in formulation. Copolymer resins will not be permitted.
2. During manufacture or prior to final acceptance of Work, Contracting Officer

may sample specimens taken from sheets, strips, or welded joints for testing.

3. Changes in formulation will be permitted only after prior notice is given to Contracting Officer and manufacturer demonstrates that new plastic liner will meet or exceed requirements for chemical resistance and physical properties.

B. Properties.

1. Plastic liner sheets including locking extensions, joints, corners, and welding strips are to be free of cracks, cleavages or other defects adversely affecting protective characteristics of material.

2. Except at shop welds, plastic liner sheets, joint, comer, and weld strips are to have the following properties when tested at 77 degrees F plus or minus 5 degrees F.

PROPERTY	ASTM TEST METHOD	CHEMICAL RESISTANCE TEST	
		INITIAL	AFTER CHEMICAL EXPOSURE (Note 1)
Tensile strength,	D 412, Die B	2200 psi	2100 psi
Elongation at break, min.	D 412, Die B	200 percent	200 percent
Shore durometer, Type D	D 2240, Within 1 sec.	50-60	± 5 (Note 2)
	D 2240, 10 sec.	35-50	± 5 (Note 2)
Weight change	(Note 3)	-----	± 1.5 % (Note 2)

Notes:

1. For 112 days in chemical solutions
2. With respect to initial test results
3. Specimen to be 1 inch x 3 inch sample sheet thickness, taken from sheet or strip prior to final acceptance of work.

.03 MATERIAL TESTS

A. Material Properties. Test samples taken from sheets, joints or weld strips to determine material properties. Determine PVC tensile strength and elongation in accordance with ASTM D 412 using Die B. Determine indentation hardness in accordance with ASTM D2240 using Type D durometer, except that single thickness of material will be used. Determination of change of weight and indentation hardness is to be made of 1-inch by 3-inch specimens. Thickness of specimens shall be thickness of sheet or strip.

B. Measurement of Initial Physical Properties. Determine initial values for tensile strength, weight, elongation and indentation hardness prior to chemical resistance tests.

C. Chemical Resistance Tests.

1. Determine physical properties of specimens after exposure to chemical solutions. Condition test specimens to constant weight at 110 degrees F before and after submersion in the following solutions for period of 112 days at 77 degrees F plus or minus 5 degrees F.

Chemical Solution	Concentration
Sulfuric acid	20 %*
Ammonium hydroxide	Sodium hydroxide5%
Nitric acid	5%*
Ferric chloride	1%*
Soap	1
Detergent (linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm

*Volumetric percentages of concentrated C.P. grade reagents

2. At 28 day intervals, remove specimens from each chemical solution and test. When specimen fails to meet 112-day property requirements specified in paragraph 2.02B before completion of 112-day exposure, material will be rejected.

D. Pull Test for Locking Extensions. Liner locking extensions embedded in concrete are to withstand test pull of at least 100 pounds per linear inch, applied perpendicularly to concrete surface for period of 1 minute, without rupture of locking extensions or withdrawal from embedment. Perform this test at temperature between 70 degrees F and 80 degrees F, inclusive.

E. Shop-Welded Joints. Shop-welded joints used to fuse individual sections of liner together, are to meet minimum requirements of liner for thickness, corrosion resistance and impermeability. Welds shall show no cracks or separations and be tested for tensile strength. Tensile strength, measured across welded joint in accordance with ASTM D 412 using Die B, shall be at least 2000 psi. Test temperature is to be 77 degrees F plus or minus 5 degrees F and use measured minimum width and thickness of reduced test specimen section.

F. Spark Test. Shop and field test liners for holidays or flaws using an approved spark tester set to provide minimum of 20,000 volts (Tinker and Rasor Model AP-W with power pack, or approved equal). Satisfactorily repair sheets having holes in shop prior to shipment from manufacturer's plant. Repairs shall be made by welders qualified in accordance with these specifications.

.04 MATERIAL DETAILS AND DIMENSIONS

A. Approval of Details. Liner sheet, strip, and other accessory pieces are to conform to requirements of these Specifications.

B. Thickness of Material. Minimum thickness of PVC sheet and strip shall be as follows:

Material	Thickness in Inches
Sheet, integral locking extensions	0.065
Sheet, plain	0.094
Joint strip	0.094
Weld strip	0.125

C. Material Sizes. Use pipe-size sheets for sheets of PVC liner to provide coverage required by Drawings. Structural sheets are to be standard 48-inches by 96-inches, with special size noted on shop drawings. Lengths specified shall include tolerance at ratio of plus or minus 1/4-inch for each 100 inches, or 0.25 percent. Joint strips shall be 4 inches plus or minus 0.25 inch in width and have each edge beveled prior to application. Weld strips shall be 1 inch plus or minus 0.125 inch in width. Weld strips are to have edges beveled at time of manufacture.

D. Locking Extensions.

1. No polygrip-type holding or locking extension will be permitted.
2. PVC liner to be embedded in concrete is to have integral locking extensions. Liner may not be bonded to concrete surfaces with adhesives except as specifically approved by Contracting Officer.
3. PVC locking extensions are to be same material as liner, be integrally molded or extruded with sheets, and have an approved cross section with minimum height of 0.375 inch and minimum web thickness of 0.085 inch. They are to be approximately 2.5 inches apart and be such that when extensions are embedded in concrete, liner will be held permanently in place.
4. PVC locking extensions are to be parallel and continuous except where interrupted for joint flaps, weep channels, strap channels and for other purposes shown on Drawings or approved by Contracting Officer.
5. The liner sheet edge which will be lower terminal edge in structure is not to extend beyond base of final locking extension more than 0.375 inch.

E. Provisions for Strap Channels. Unless alternate methods are acceptable to Contracting Officer, liner required to be secured to inner form with straps are to have strap channels at not more than 20 inches on center perpendicular to locking extensions. Strap channels are to be maximum of 1-inch wide and formed by removing locking extensions so that maximum of 3/16-inch remains. Channels are not to be provided in final two locking extensions adjacent to terminal edge of liner coverage.

F. Flaps. When transverse flaps are specified or required, fabricate by removing locking extensions so that no more than 1/32 inch of base of locking extensions remains on sheet.

G. Adhesive Products. Adhesive products and application procedures used in installation of liner are to be according to manufacturer's recommendations. Adhesive products intended for use inside cast-in-place structures are to be non-flammable.

H. Cleaners. Cleaners used in installation of liner shall be approved by Contracting Officer prior to use. Cleaners are to be nonflammable and water soluble or water dispersible and not be detrimental to plastic liner.

I. Caulking Products. Caulking products and application procedures used in installation of liner and appurtenances are to be as recommended by manufacturer.

J. Mechanical Anchors. When approved for use with plain sheet liner, provide anchors and washers of Type 316 stainless steel, and as recommended by liner manufacturer.

PART 3 EXECUTION

.01 NOTIFICATION

A. Notify Contracting Officer at least 24 hours before reinforcing steel placement so that lining may be inspected and errors corrected without delaying Work.

.02 PLACING LINER

A. Location. Place liner throughout entire length of interceptor sewer along top 300 degrees of pipe circumference, and inside structures as indicated on Drawings. Liner is to be applied and secured to forms and inspected by Contracting Officer prior to placement of reinforcing steel.

B. Coverage.

1. In cast-in-place structures, no offset of lower terminal edge is permitted. Unless otherwise shown on Drawings, lower terminal edge is to be one foot below low water level or 6 inches below top of grout or concrete fillet, whichever is higher.

2. At station where there is difference in pipe's circumferential liner coverage, as shown on Drawings, and longitudinal terminal edges of liner downstream from that station are lower than those upstream, uniformly slope terminal edges of liner installed in section of pipe or structure immediately upstream from station for entire length of section of pipe or structure from limits of smaller coverage to those of greater coverage. Wherever longitudinal terminal edges of liner downstream from station are higher than those upstream, accomplish slope uniformly throughout length of section of pipe or structure immediately downstream from station. Provide an approved locking extension along sloping lower terminal edges of liner plate.

C. Positioning Liner.

1. Position PVC liner installed in pipe so that locking extensions are parallel to longitudinal axis of pipe.
2. Position PVC liner installed in cast-in-place structures so that locking extensions are parallel to direction of concrete placement, which is normally vertically for vertical walls.
3. Closely fit liner to inner forms. Cut sheets to fit curved and warped surfaces using minimum number of separate pieces.
4. The Contracting Officer may require use of patterns or marking of sheet layouts directly on forms where complicated warped surfaces are involved.
5. At transverse joints between sheets of liner used in cast-in-place structures and pipe joints, space between ends of locking extensions, measured longitudinally, shall not exceed 4 inches. Where sheets are cut and joined for purpose of fitting irregular surfaces, this space shall not exceed 2 inches.

D. Securing Liner in Place.

1. Liner shall be held snugly in place against inner forms. For pipes and similar circular sections, use light steel banding straps or other approved means. Prefabricated pipe-size tubular sheets which do not require strap channels may also be used.
2. When used, place banding straps in strap channels, as specified under provision for strap channels, at spacing not to exceed 20 inches.
3. Any method of banding, other than in strap channels, shall be reviewed by Contracting Officer prior to use.
4. On vertical surfaces where form ties or form stabilizing rods pass through liner, make provisions to maintain liner in close contact with forms during concrete placement. These provisions shall be reviewed by Contracting Officer.
5. Prevent concrete from flowing around edges of sheets at joints by sealing joint or seam with waterproof tape recommended by manufacturer.
6. Forms in contact with plastic liner need not be oiled.

E. Weep Channels.

1. At each pipe joint and at transverse joints in cast-in-place structures, gap not less than 2 inches nor greater than 4 inches shall be left in locking extensions to provide transverse weep channel. When locking extensions are removed to provide weep channel at joints, base of extension left on sheet shall not exceed 3/16 inch.
2. Provide intermediate weep channels as required to maintain maximum spacing of 8 feet. Intermediate weep channels shall not be less than 2.0 inches nor greater than 4.0 inches in width. When locking extensions are removed to provide intermediate weep channels, base of extension left on sheet shall not exceed 3/1.6 inch.
3. Any area behind liner, which is not properly served by regular weep channels, shall have additional weep channels 2 inches wide provided by cutting away locking

extensions.

4. Provide transverse weep channel approximately 12 inches away from each liner return where surfaces lined with plastic liner join surfaces which are not so lined.
5. As part of work of installing liner, clear outlets of weep channels of obstructions which would interfere with their proper functions.
6. Design weep channels for external hydrostatic pressures of water column equal in height to greater of 50 feet (22 psi) or 1.1 times depth of burial.

F. Liner Returns.

1. Install liner return where shown on approved shop drawings and wherever surfaces lined with plastic liner joins surfaces which are not so lined.
2. Unless otherwise indicated by Drawings or approved shop drawings showing liner installation methods, make returns as follows:
   a. Return liner at least 3 inches at surfaces of contact between concrete structure and items not concrete (including access frames, gate guides and pipe penetrations).
   b. Follow the same procedure at joints where type of protective lining is changed, or new work is built to join existing unlined concrete.
3. Provide locking extensions on returns to lock returns to concrete of plastic-lined, cast-inplace structures.
4. Seal each liner return to adjacent construction with which it is in contact by means of an adhesive system recommended by manufacturer and acceptable to Contracting Officer. When joint space is too wide or joint surfaces too rough to permit use of compound, fill joint space with 2 inches of densely caulked cement mortar, lead wool, or other caulking material and finished with minimum of I inch depth of an approved corrosion resistant sealant material.

.03 CONCRETING OPERATIONS

A. Concrete Placement.

1. Carefully vibrate concrete placed against liner shall be so as to avoid damage to liner and to produce dense concrete securely anchoring locking extensions into concrete. Use external vibrators in addition to internal vibrators, particularly along lower terminal edge of liner.
2. Stiffeners, when used along locking extensions of liner installed in forms for pipe, shall be withdrawn completely during placement of concrete in forms. Revibrate concrete to consolidate concrete in void spaces caused by withdrawal of stiffeners.

B. Removing Forms.

1. In removing forms, take care to protect liner from damage. Do not use sharp instruments to pry forms from lined surfaces. When forms are removed, pull nails that remain in liner plate without tearing liner and clearly mark resulting holes. Mark form tie holes before ties are broken off. Mark areas of abrasion of liner.

2. Following completion of form removal, clean liner in pipe and structures for inspection.

3. Remove banding straps used in securing liner to forms for pipe and cast-in-place structures within limits of unlined invert.

.04 FIELD JOINTING OF LINER

A. Installation Requirements.

1. No field joint shall be made in liner until lined pipe or structure has been backfilled and 7 days have elapsed after flooding or jetting has been completed. Where ground water is encountered, joint shall not be made until pumping of ground water has been discontinued for at least 7 days and no visible leakage is evident at joint. Liner at joints shall be free of mortar and other foreign material and be clean and dry before joints are made.

2. Hot joint compound shall not be brought in contact with liner.

3. No coating shall be applied over joint, comer or welding strip, except where nonskid coating is applied to liner surfaces.

B. Field Joints in Pipe Installation.

1. Field joints in lining at pipe joints shall be one of the following types:

a. Type P-1. Make joint with separate 4-inch joint strip and two welding strips. Center 4-inch joint strip over joint, heat-sealed to lining, then welded along each edge to adjacent liner sheets with 1-inch weld strip. 4-inch joint strip shall lap over each sheet minimum of 1/2 inch.

b. Type P-2

1) Make joint with joint flap with locking extensions removed as described in paragraph 2.04 above, and extending approximately 4 inches beyond pipe end. Joint flap shall overlap lining in adjacent pipe section minimum of 1/2 inch and be heat-sealed in place prior to welding. Complete field joint by welding flap to lining of adjacent pipe using 1-inch weld strip.

2) Take care to protect flap from damage. Avoid excessive tension and distortion in bending back flap to expose pipe joint during laying and joint mortaring. At temperatures below 50 degrees F heating of liner may be required to avoid damage.

2. Do not make field joints in liner at pipe joints until mortar in pipe joint, when used, has been allowed to cure for at least 48 hours.

3. Joints between lined pipe and lined structures are to be either Type C-1 joint or Type C-2 joint as described below.

C. Field Joints in Concrete Structures. Field joints in liner on concrete structures are to be one of following types:

1. Type C-1. Make joint with separate 4-inch joint strip and two welding strips.

Center flinch joint strip over joint, heat-sealed to liner, then welded along each edge to adjacent sheets with 1-inch wide weld strip. Width of space between adjacent sheets is not to exceed 2 inches. 4-inch joint strip is to lap over each sheet minimum of 1/2 inch. It may be used at transverse or longitudinal joint.

2. Type C-2. Make joint by lapping sheets not less than 1/2 inch. One 1-inch weld strip is required. Upstream sheet is to overlap one downstream. Heat-seal lap into place prior to welding on 1-inch weld strip.

3. Type C-3. Make joint by applying 2-inch wide waterproof tape or 1-inch wide welding strip on back of maximum 1/4-inch gap butt joint or by some other method approved by Project Manager to prevent wet concrete from getting under sheet. After forms have been stripped, apply 1-inch weld strip over face to sheet.

D. Installation of Welding Strips.

1. All welding of joints is to be in strict conformance with specifications and instructions of lining manufacturer.

2. Welding is to fuse both sheets and weld strip together to provide continuous joint equal in corrosion resistance and impermeability to liner plate.

3. Hot-air welding tools shall provide effluent air to sheets to be joined at temperature between 500 degrees F and 600 degrees F. Hold welding tools approximately 1/2 inch from and moved back and forth over junction of two materials to be joined. Move welding tool slowly enough as weld progresses to cause small bead of molten material to be visible along both edges and in front of weld strip.

4. Maintain adequate ventilation in confined spaces during welding operations.

5. After repairs have been made, defective welds will be re-inspected and re-tested.

E. Joint Reinforcement. Apply 12-inch long welding strip as reinforcement across each transverse joint and weep channel which extends to lower terminal edge of liner. Center reinforcement strips over joint being reinforced and located as close to lower edge of liner as practicable. Weld in place after transverse welding strips have been installed.

F. Application of Liner to Concrete Surfaces with Adhesives. Application of liner plate to concrete surfaces by means of adhesive is allowed only where shown on Drawings for existing structures, or where specifically acceptable to Contracting Officer and called out on approved shop drawings, and is to be accomplished by following steps:

1. Etch concrete surface by abrasive blasting to develop slightly granular surface.

2. After abrasive blasting, thoroughly clean concrete surface of dust.

3. Apply primer, adhesive and liner in strict accordance with manufacturer's recommendations, as approved by Contracting Officer.

4. Place mechanical anchors at 12-inch centers each way after adherence of liner to concrete surface has been achieved. Place anchors after adhesive system has cured for minimum of 24 hours. Seal penetration of liner by anchor in accordance with manufacturer's recommendations.

G. Nonskid Surfaces. Surfaces of liner, shown on Drawings to be nonskid, treated as follows prior to installation:

1. Liner is to be cleaned, dried, and spread with an adhesive coating recommended by manufacturer of liner plate.
2. Liberally sprinkle surface with clean, dry, well graded sand, which will pass No. 30 sieve but be retained on No. 70 sieve.
3. After sanded surface has thoroughly dried, brush away excess sand and spray seal coat of adhesive coating over sand in sufficient quantity to coat and bond sand to liner plate.
4. Allow coated sand surface to dry thoroughly before handling.

H. Protection and Repair of Liner.

1. Take necessary measures and precautions to prevent damage to liner from equipment and materials used in or taken through Work. Repair damage to installed liner plate in accordance with requirements for repair of liner.
2. Patch nail and tie holes and cut, torn and seriously abraded areas in liner plate. Patches made entirely with welding strip are to be fused to liner over entire patch. Use of this method is limited to patches which can be made with single welding strip. Use of parallel, overlapping or adjoining welding strips will not be permitted. Larger patches may consist of smooth liner over damaged area, with edges covered with welding strips fused to patch and to liner adjoining damaged area. Limit size of single patch of latter type only as to its width, which shall not exceed 4 inches.
3. Whenever liner is not properly anchored to concrete, or whenever patches larger than those permitted above are necessary, accomplish repair of liner and restoration of anchorage by injecting epoxy grout behind liner plate by method approved by Contracting Officer. Use of adhesives will not be allowed to repair improperly anchored liner plate.

I. Field Tests.

1. Upon completion of installation, clean surface of liner to permit visual inspection and spark testing by Contractor under supervision of Contracting Officer, using spark-type detector complying with requirements for Spark Test. Properly repair and retest areas of liner failing to meet field test.
2. Contractor is to assist in inspection and spark testing by providing adequate ventilation, ladders for access, barricades or other traffic control devices, and is responsible for opening and closing entrances and exits.
3. Spark testing of liner by Contractor under supervision of Contracting Officer is to be done with detector complying with these Specifications.

END OF SECTION

SECTION 02441

MICROTUNNELING AND PIPE-JACKED TUNNELS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Tunnel construction of sewers by one-pass methods with or without man entry. Construction methods involve jacking pipe following hand-shield excavation or tunnel boring machine (TBM) or micro-tunnel boring machine (MTBM), with pipe serving as both tunnel liner during construction and sewer pipe after completion of construction.

B. Select centrifugally-cast fiberglass pipe (FRP), vitrified clay pipe (VCP), reinforced concrete pipe (RCP) for storm or sanitary sewers. Use plastic-lined RCP for sanitary sewers. Unlined RCP or RCP lined with liner other than that specified in Section 02427 - Plastic Liner for Large-diameter Concrete Sewers and Structures will not be allowed for sanitary sewers.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Length of sewer installed will be measured by linear foot along center line of completed sewer from center line to center line of manholes, as designated on Drawings; and to end of stubs or termination of pipe; and to inside face of lift station and treatment plant works. Installation of sewer within limits of structure other than manholes will not be considered for measurement and payment at unit price bid.

2. Payment will include and be full compensation for labor, equipment, materials, and supervision for construction of sewer and excavation, complete in place including disposal of excess materials, sheeting, shoring or bracing, dewatering, utility adjustments, connections to existing sewers, grouting when required, tests, backfilling, clean-up, and other related work necessary for construction as specified or as shown on Drawings.

3. Payment for installation of sewer will be authorized by AW Project Manager in two parts. Pay estimates for partial payments will be made as measured above according to following schedule:

   a. 95 percent payment will be made for jacked pipe installed but not yet grouted, in cases where grouting is specified.

   b. 100 percent payment will be authorized on linear foot basis for amount of jacked sewer pipe installed, including grouting when specified.

4. Monitoring will be paid for at lump sum price for installations, observations, and reporting.

B. Stipulated Price (Lump Sum): If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCE STANDARDS

A. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

B. American Association of State Highway and Transportation Officials (AASHTO).

C. Occupational Safety and Health Administration (OSHA).

D. National Electrical Code - (NFPA 70).

.04 DEFINITION

A. Jacked Pipe. Method for installing sewer pipe that serves as initial construction lining and tunnel support, installed for stability and safety during construction, and as sewer pipe. Pipe is shoved forward, or jacked, as tunnel is advanced.

B. Microtunneling. Method of installing pipe by jacking pipe behind microtunnel boring machine which is connected to and shoved forward by pipe being installed, generally precluding man entry.

C. Tunnel Boring Machine (TBM). Mechanized excavating equipment that is steerable, guided and articulated, connected to and shoved forward by pipe being installed, with man entry.

D. Microtunnel Boring Machine (MTBM). Mechanized excavating equipment that is remotelycontrolled, steerable, guided and articulated, connected to and shoved forward by pipe being installed, usually precluding man entry.

E. Tunneling Methodology. Written description, together with supporting documentation that defines plans and procedures for microtunneling or pipe jacking operations.

F. Zone of Active Excavation. Area located within radial distance about surface point immediately above face of excavation equal to depth to bottom of excavation.

G. Critical Structure. Building, structure, bridge, pier, or similar construction partially or entirely located within zone of active excavation.

.05 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Following submittals are required:

1. Tunneling Methodology. Brief description of proposed tunnel methodology. Description should be sufficient to convey following:

a. Proposed method of tunnel construction and type of face support.

b. Manufacturer and type of tunneling equipment proposed; type of lighting and ventilation systems.

c. Number and duration of shifts planned to be worked each day.

d. Sequence of operations,

e. Locations of access shafts and work sites.

f. Method of spoil transportation from face, surface storage and disposal location.

g. Capacity of jacking equipment and type of cushioning.

h. Identify critical utility crossings and special precautions proposed.

2. Drawings and Calculations: Submit for record purposes, drawings and calculations for tunnel support system. Provide adequate drawings and installation details for construction. For pipe jacking and microtunneling, show pipe and pipe joint detail. Documents must be signed and sealed by Professional Engineer registered in the state where the project is being completed. Calculations shall include clear statement of criteria used for design as described in Paragraph 1.06, Design Criteria.

3. Quality Control: Submit for review brief description of quality control methods including:

   a. Method and frequency of survey control.

   b. Example of tunnel daily log.

4. Geotechnical Investigation: When geotechnical investigations are conducted, submit results to Project Manager for record purposes.

5. Monitoring Plans:

   a. Instrumentation Monitoring Plan: Submit for review, prior to construction, monitoring plan that includes schedule of instrumentation design, layout of instrumentation points, equipment installation details, manufacturer's catalog literature, and monitoring report forms.

   b. Surface Settlement Monitoring Plan. Submit settlement monitoring plan for review prior to construction. Identify on plan location of settlement monitoring points, reference benchmarks, survey frequency and procedures, and reporting formats.

6. Structures Assessment. Provide preconstruction and post construction assessment reports for critical structures, namely those located within zone of active excavation from proposed tunnel centerline. Include photographs or video of existing damage to structures in vicinity of sewer alignment in assessment reports.

7. Readings of all monitoring shall be submitted to Project Manager.

8. Daily Reports: Maintain shift log as defined in Paragraph 3.04, Pipe jacked Tunneling Data, and make available to AW Project Manager on request.

.06 DESIGN CRITERIA

A. Assume responsibility for selection of appropriate pipe and pipe joints to carry thrust of any jacking forces or other construction loads in combination with

overburden, earth and hydrostatic loads. Design of any pipe indicated on Drawings considers in-place loads only and does not take into account any construction loads. Criteria for longitudinal loading (jacking forces) on pipe and joints shall be determined, based on selected method of construction.

B. Jacked pipe shall be designed to withstand thrust from MTBM, TBM or shield and pipe advance without damage or distortion. Propulsion jacks shall be configured so that thrust is uniformly distributed and will not damage or distort pipe.

C. Take into account loads from handling and storing.

D. Criteria to be used at railroad crossings shall be Cooper E-80 locomotive loading distributions in accordance with AREMA specifications for culverts. In design, account for additive loadings due to multiple tracks.

E. Criteria to be used for truck loading shall be HS-20 vehicle loading distributions in accordance with AASHTO.

F. Provide pipes of diameter shown on Drawings. Substitution of pipe with larger diameter to suit MTBM or TBM equipment availability will only be permitted if demonstrated to satisfaction of AW Project Manager that design flows and velocities can be achieved.

PART 2 PRODUCTS

.01 SEWER PIPE

A. Assume responsibility for selecting appropriate pipes and pipe joints to safely carry loads imposed during construction, including jacking forces. Pipe joints shall be flush with outside pipe face when pipes are assembled. Pipe materials shall be selected from following:

B. Plastic-lined reinforced concrete pipe with joints and fittings to be in accordance with Section 02427 - Plastic Liner for Large-Diameter Concrete Sewers and Structures. Plastic liner is not required for storm sewers.

C. Use pipe that is round with smooth, even outer surface, and has joints that allow for easy connections between pipes. Design pipe ends so that jacking loads are evenly distributed around entire pipe joint and such that point loads will not occur when pipe is installed. Pipe used for pipe jacking shall be capable of withstanding all forces that will be imposed by process of installation, as well as final in-place loading conditions. Protect driving ends of pipe and joints against damage.

PART 3 EXECUTION

.01 CONSTRUCTION OPERATIONS CRITERIA

A. Use methods for microtunneling and pipe jacked tunneling operations that will minimize ground settlement. Select method which will control flow of water

and prevent loss of soil into tunnel and provide stability of face under anticipated conditions.

B. Conduct tunneling operations in accordance with applicable safety rules and regulations, OSHA standards and Contractor's safety plan. Use methods which include due regard for safety of workmen, adjacent structures, utilities, and public.

C. Maintain clean working conditions wherever there is man access.

D. For tunneling under railroad embankments, highways, or streets, perform installation so as to avoid interference with operation of railroads, highways, or streets, except as approved by owner of facility.

.02 GROUND WATER CONTROL

A. Provide ground water control measures in conformance with Control of Ground Water and Surface Water, when necessary to perform Work.

.03 EQUIPMENT

A. Full directional guidance of shield, TBM, or MTBM is prerequisite of this method of construction.

B. Assume responsibility for selection of tunneling equipment which, based on past experience, has proven to be satisfactory for excavation of soils to be encountered.

C. Employ tunneling equipment that will be capable of handling various anticipated ground conditions and is capable of minimizing loss of soil ahead of and around machine and shall provide satisfactory support of excavated face.

D. Tunnel Boring Machine (TBM). A TBM used for pipe-jacking shall conform to shape of tunnel with uniform perimeter that is free of projections that could produce over- excavation or voids. Appropriately sized overcutting bead may be provided to facilitate steering. In addition it shall:

1. Be capable of full face closure.
2. Be equipped with appropriate seals to prevent loss of bentonite lubricant.
3. Be capable of correcting roll by reverse drive or fins.
4. Be designed to handle adverse ground conditions including ground water ingress.
5. Be equipped with visual display to show operator actual position of TBM relative to design reference.

E. Tunnel Shield. If hand shield is used for pipe jacked tunneling (with or without attached mechanized excavating equipment), shield must be capable of handling various anticipated ground conditions. In addition, shield shall:

1. Conform to shape of tunnel with uniform perimeter that is free of projections that could produce over-excavation or voids. Appropriately-sized overcutting bead may be provided to facilitate steering.

2. Be designed to allow face of tunnel to be closed by use of gates or breasting boards without loss of ground.

F. Microtunneling Equipment. In case of MTBM, use spoil transportation system which:

1. Balances soil and ground water pressures by use of slurry or earth pressure balance system; system shall be capable of adjustments required to maintain face stability for particular soil condition and shall monitor and continuously balance soil and ground water pressure to prevent loss of slurry or uncontrolled soil and ground water inflow, or, in case of slurry spoil transportation system:

   a. Provides pressure at excavation face by use of slurry pumps, pressure control valves, and flow meter.

   b. Includes slurry bypass unit in system to allow direction of flow to be changed and isolated, as necessary.

   c. Includes separation process. Design it to provide adequate separation of spoil from slurry so that slurry with sediment content within limits required for successful tunneling can be returned to cutting face for reuse. Appropriately contain spoil at site prior to disposal.

   d. Uses type of separation process suited to size of tunnel being constructed, soil type being excavated, and work space available at each work area for operating plant.

   e. Allows composition of slurry to be monitored to maintain slurry weight and viscosity limits required.

2. In case of cased auger earth pressure balance system, system shall be capable of adjustments required to maintain face stability for particular soil condition to be encountered. Monitor and continuously balance soil and ground water pressure to prevent loss of soil or uncontrolled ground water inflow.

   a. In cased auger spoil transportation system, manage pressure at excavation face by controlling volume of spoil removal with respect to advance rate. Monitor speed of rotation of auger flight, and addition of water.

3. Remote Control System. Provide MTBM which includes remote control system with following features:

   a. Allows for operation of system without need for personnel to enter tunnel. Has display available to operator, at remote operation console, showing position of shield in relation to design reference together with other information such as face pressure, roll, pitch, steering attitude, valve positions, thrust force, and cutter head torque; rate of advance and installed length.

   b. Integrates system of excavation and removal of spoil and its simultaneous replacement by pipe. As each pipe section is jacked forward, control system shall synchronize all of operational functions of system.

4. Active Direction Control. Provide MTBM which includes active direction control system with following features:

a. Controls line and grade by guidance system that relates actual position of MTBM to design reference (e.g., by laser beam transmitted from jacking shaft along pipe to target mounted in shield).

b. Provides active steering information which shall be monitored and transmitted to operating console.

c. Provides positioning and operation information to operator on control console.

5. Use generator which is suitably insulated for noise ("hospital" type) in residential or commercial areas.

G. Pipe Jacking Equipment. Provide pipe jacking system with following features:

1. Has main jacks mounted in jacking frame located in starting shaft.

2. Has jacking frame which successively pushes string of connected pipes following tunneling excavation equipment towards receiving shaft.

3. Has sufficient jacking capacity to push tunneling excavation equipment and string of pipe through ground. Incorporates intermediate jacking stations, if required.

4. Has capacity at least 20 percent greater than calculated maximum jacking load.

5. Develops uniform distribution of jacking forces on end of pipe by use of spreader rings and packing, measured by operating gauges.

6. Provides and maintains pipe lubrication system at all times to lower friction developed on surface of pipe during jacking.

7. Jack Thrust Reactions. Use reactions for pipe jacking that are adequate to support jacking pressure developed by main jacking system. Special care shall be taken when setting pipe guide rails in jacking shaft to ensure correctness of alignment, grade, and stability.

H. Air Quality. Provide equipment to maintain proper air quality of manned tunnel operations during construction in accordance with OSHA requirements.

I. Enclose lighting fixtures in watertight enclosures with suitable guards. Provide separate circuits for lighting, and other equipment.

J. Electrical systems shall conform to requirements of National Electrical Code - NFPA70.

.04 PIPE-JACKED TUNNELING DATA

A. Maintain shift logs of construction events and observations. AW Project Manager shall have access to all logs with regard to following information:

1. Location of boring machine face or shield by station and progress of tunnel drive during shift.

2. Hours worked per shift on tunneling operations.

3. Completed field forms, such as steering control logs, for checking line and grade of tunneling operation, showing achieved tolerance relative to design alignment.

4. Maximum pipe jacking pressures per drive.

5. Location, elevation and brief soil descriptions of soil strata.
6. Ground water control operations and piezometric levels.
7. Observation of any lost ground or other ground movement.
8. Any unusual conditions or events.
9. Reasons for operational shutdown in event drive are halted.

.05 EXCAVATION AND JACKING OF PIPE

A. Tunnel Excavation.

1. Keep tunnel excavation within easements and rights-of-way indicated on Drawings and to lines and grades designated on Drawings.
2. Perform tunneling operations in manner that will minimize movement of ground in front of and surrounding tunnel. Prevent damage to structures and utilities above and in vicinity of tunneling operations.
3. Open-face excavations:
   a. Keep face breasted or otherwise supported and prevent falls, excessive raveling, or erosion. Maintain standby face supports for immediate use when needed.
   b. During shut-down periods, support face of excavation by positive means; no support shall rely solely on hydraulic pressure.
4. Closed-face excavation:
   a. Carefully control volume of spoil removed. Advance rate and excavation rate to be compatible to avoid over excavation or loss of ground_
   b. When cutting head is withdrawn or is open for any purpose, keep excavated face supported and stabilized.
5. Excavated diameter should be minimum size to permit pipe installation by jacking with allowance for bentonite injection into annular space.
6. Whenever there is condition encountered which could endanger tunnel excavation or adjacent structures, operate without intermission including 24-hour working, weekends and holidays, until condition no longer exists.
7. Assume responsibility for damage due to settlement from any construction-induced activities.

B. Pipe Jacking

1. Cushion pipe joints as necessary to transmit jacking forces without damage to pipe or pipe joints.
2. Maintain envelope of bentonite slurry around exterior of pipe during jacking and excavation operation to reduce exterior friction and possibility of pipe seizing in place.
3. If pipe seizes up in place and elect to construct recovery access shaft, obtain approval from AW Project Manager. Coordinate traffic control measures and

utility adjustments as necessary prior to commencing work.

4. In event section of pipe is damaged during jacking operation, or joint failure occurs, as evidenced by inspection, visible ground water inflow or other observations, submit for approval his methods for repair or replacement of pipe.

C. Grouting. Grouting requirements are defined in Section 02431 - Tunnel Grout.

.06 CONTROL OF LINE AND GRADE

A. Construction Control.

1. Project Manager will establish baselines and benchmarks indicated on Drawings. Check baselines and benchmarks at beginning of Work and report any errors or discrepancies to AW Project Manager.

2. Use baselines and benchmarks established by AW Project Manager to establish and maintain construction control points, reference lines and grades for locating tunnel, sewer pipe, and structures.

3. Establish construction control points sufficiently far from work so as not to be affected by ground movement caused by pipe-jacked tunneling operations.

B. Bench Mark Movement. Ensure that if settlement of ground surface occurs during construction which affects accuracy of temporary benchmarks detect and report such movement and reestablish temporary bench marks. Locations of permanent local monumentation benchmarks are indicated on Drawings. Advise AW Project Manager of any settlement affecting permanent monumentation benchmarks.

C. Line and Grade.

1. Check and record survey control for tunnel against above-ground undisturbed reference at least once for each 250 feet of tunnel constructed.

2. Record exact position of MTBM or TBM or shield after each shove to ensure alignment is within specified tolerances. Make immediate correction to alignment before allowable tolerances are exceeded.

3. When excavation is off line or grade, make alignment corrections to avoid reverse grades in gravity sewers.

4. Acceptance criteria for sewer pipe shall be plus or minus 6 inches in horizontal alignment from theoretical at any point between manholes, including receiving end, and plus or minus 1-1/2 inches in elevation from theoretical.

5. Pipe installed outside tolerances and subsequently abandoned shall first be fully grouted.

.07 MONITORING

A. Instrumentation Monitoring. Instrumentation requirements are shown on Drawings. Instrumentation specified shall be accessible at all times to AW Project Manager. Readings shall be submitted promptly to AW Project Manager.

1. Install and maintain instrumentation system to monitor and detect movement of ground surface and adjacent structures. Establish vertical control points at distance from construction areas that avoids disturbance due to ground settlement.
2. Installation of instrumentation shall not preclude AW Project Manager, through independent contractor or consultant, from installing instrumentation in, on, near, or adjacent to construction work. Access shall be provided to work for such independent installations.
3. Instruments shall be installed in accordance with Drawings and manufacturer's recommendations.

B. Surface Settlement Monitoring

1. Establish monitoring points on all critical structures.
2. Record location of settlement monitoring points with respect to construction baselines and elevations. Record elevations to accuracy of 0.01 feet for each monitoring point location. Monitoring points should be established at locations and by methods that protect them from damage by construction operations, tampering, or other external influences.
3. Ground surface elevations shall be recorded on centerline ahead of tunneling operations at minimum of 100-foot intervals or at least three locations per tunnel drive. For sewers greater than 60-inch diameter, also record similar data at approximately 20 feet each side of centerline. Settlement monitoring points must be clearly marked by studs or paint for ease of locating.
4. Railroads. Monitor ground settlement of track subbase at centerline of each track.
5. Utilities and Pipelines. Monitor ground settlement directly above and 10 feet before and after utility or pipeline intersection.

C. Reading Frequency and Reporting. Submit to AW Project Manager, records of readings from various instruments and survey points.

1. Instrumentation monitoring results to be read at frequency specified and unless otherwise specified, shall be started prior to zone of active excavation reaching that point, and shall be continued until zone of active excavation has passed and until no further detectable movement occurs.
2. Surface settlement monitoring readings shall be taken:
   a. Prior to zone of active excavation reaching that point,
   b. When tunnel face reaches monitoring point (in plan), and
   c. When zone of active excavation has passed and no further movement is detected.
3. All monitoring readings shall be submitted promptly to AW Project Manager.
4. Immediately report to AW Project Manager any movement, cracking, or settlement which is detected.
5. Following substantial completion but prior to final completion, make final survey of all monitoring points.

.08 DISPOSAL OF EXCESS MATERIAL

A. Remove spoil materials off site in accordance with contract specification requirements.

.09 ACCEPTANCE TESTING

A. Acceptance testing is to be carried out by methods described in Section 02533 - Acceptance Testing For Sanitary Sewers.

END OF SECTION

SECTION 02447

AUGERING PIPE AND CONDUIT

PART 1 GENERAL

.01 SECTION INCLUDES

A. Installing water service pipe by methods of augering or casing by jacking and boring.

B. Installing Telecommunication Conduit along or under Public Ways

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for augering pipe for water lines under this Section. Include payment in unit price for Section 02511 - Watermains.
2. When open-cut construction is requested by Contractor for his convenience in areas designated for augering, and when approved in advance by Project Manager, such areas shall be paid for at Unit Price for Section 02511 - Watermains.
3. Refer to Section - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 DEFINITIONS

A. Auger Method: Installation of steel casing by excavating soil at advancing end of casing and transporting spoil through casing by otherwise encased auger, while advancing casing by jacking at same rate as auger excavation progresses.

B. Slurry Auger Method: Installation of casing or pipe by first drilling small diameter pilot hole from pit to pit, followed by removing excess soil and installing pipe or conduit by pull-back or jacking method.

.04 REFERENCE STANDARDS

A. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

B. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.

C. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.

D. ASTM D 790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

.05 REGULATORY REQUIREMENTS

A. Conform to State Department of Highways and Public Transportation for installations under state highways. AW will obtain required permits for State Highway crossings.

B. Installations Under Railroads:

1. Secure and comply with requirements of right-of-entry for crossing Railroad Company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements.
2. Use auger method only.
3. Damages due to delays caused by railroad requesting work to be done at hours which will not inconvenience the railroad will be at no additional cost to AW.
4. Maintain equipment and excavations minimum 35-foot clearance from centerline of tracks.

.06 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit product data for casing insulators, spacing of insulators for specific pipe and location on project.

C. Prior to installation of pits obtain AW Project Manager's approval for pit locations, size, depth, and areas for storage, material, and spoil handling. Acceptance of AW Project Manager does not relieve Contractor from responsibility to obtain specified results.

D. Show actual pit locations dimensioned on as-built drawings so that they can be identified in field.

E. Submit copy of executed railroad company rights of entry to AW Project Manager.

.07 CRITERIA FOR SELECTION OF MATERIAL

A. Contractor shall be responsible for selection of casing, pipe, and pipe joints to carry anticipated thrust of jacks or loads.

PART 2 PRODUCTS

.01 MATERIALS

A. Piping and Fittings: As required by Specification or Drawings.

B. Casings: Where shown on Drawings, in accordance with Section 02502 - Steel Pipe and Fittings.

C. Casing Spacers: Where casings are shown on Drawings, use casing spacer width 8 inches for pipe sizes 4 to 12 inches; 12 inches for pipe sizes 14 inches and larger. Wood skids or concrete "donuts" are not acceptable.

1. For welded steel pipe 12 inches and smaller, use Pipeline Seal & Insulator Model PE, or approved equal.
2. For other pipe materials, use Pipeline Seal & Insulator Model C8G-2 or approved equal for pipe sizes up to 12 inches.
3. For all pipe sizes above 12 inches, use Pipeline Seal & Insulator Model C12G-2 or approved equal.
4. Obtain approval for equal product in writing from AW Project Manager prior to bid.
5. Use ISO-9002 registered casing spacer manufacturer or supplier. Submit copy of current certificate with submittal package.

D. Casing End Seals: Provide Pipeline Seal and Insulator Model C, or approved equal.

E. Casing Spacers (For Pipes Diameters 16 Inches or Greater): Bolt-on style with shell made of two sections of 14-gauge carbon steel, hot rolled, cleaned, and lined with PVC liner, 0.090 inch thick with Durometer A 85-90 overlapping edges to secure liner to spacer; deep embossed flanges for added strength; coated prior to installation of liner and runner with fusion-bonded PVC powder of 14 to 20 mils thickness; electroplated studs, nuts, and washers.

1. Runners (For Pipe Diameters 16 Inches or Greater): Supported by 10-gauge carbon steel MIG risers welded to shell. Total length of weld beads shall be at least 50 percent of the length of the runner. Fill bolt holes with caulk or approved equal to provide a water-tight seal. Minimum requirements: Glass reinforced plastic conforming to the following tests:
   a. Tensile Strength: ASTM D 638; 17,600 psi
   b. Flexural Strength: ASTM D 790; 25,300 psi
   c. Compression Strength: ASTM D 695; 18,000 psi
   d. Deflection Temperature at 264 psi: ASTM D 648; 405 F
   e. Polyethylene runners are not acceptable

PART 3 EXECUTION

.01 LIMITS ON AUGER LENGTH WITHOUT CASING

A. Do not exceed 100 feet for length of auger hole without receiving pit.

B. Do not exceed 75 feet for length of auger hole for PVC pipe 12 inches and less in diameter without receiving pit.

C. Do not exceed 40 feet for length of auger hole for PVC pipe 14 inches to 24 inches in diameter without receiving pit.

.02 PREPARATION

A. Conform to applicable provisions of Section 02233 - Clearing and Grubbing.

B. Utility Relocations: Relocate utility lines clear of pit and zone of potential significant settlement or other ground disturbance.

C. Install casings as required by Drawings, in accordance with this Section.

D. Install temporary solid plug at open end of water line to prevent contamination.

.03 TRAFFIC CONTROL

A. Conform to applicable provisions of the contract documents.

B. Secure right-of-entry for crossing Railroad Company's easement or right-of-way.

C. During construction operations, furnish, and maintain barricades and lights to safeguard traffic and pedestrians, until such time as backfill has been completed and removed from site. Provide additional barricades and lights as directed by AW Project Manager.

.04 PITS

A. Construct pits on segments of line and within right-of-way. Locate auger pits where there is minimum interference with traffic or access to property. Avoid locating pits close to storm drainage channels, ditches, storm water lines, culverts, or near potentially contaminated areas.

B. Pit Size: Size pits to provide adequate room to meet operational requirements for auger construction as well as structures indicated on Drawings. Provide minimum 6-inch space between pipe and walls of auger pit. Maximum allowable width of pit shall be 5 feet. Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than 5 feet longer than one full section of pipe and shall not exceed 25 feet.

C. Excavate bore pits to finished grade at least 6 inches lower than grade indicated by stakes.

D. Backfill in accordance with Section 02317 - Excavation and Backfill for Utilities.

E. Auger pits that are excavated and backfilled as part of open-cut water line construction shall be in accordance with Section 02317 - Excavation and Backfill for Utilities.

F. Provide and properly maintain safety protection against traffic, and accidental or unauthorized entry. Provisions to include concrete traffic barriers or other suitable barrier around periphery of pit as appropriate. Fully cover and secure pits where no construction activity is in progress.

G. Install sheeting, lining, shoring, and bracing required for protection of workmen and public.

H. Provide groundwater control and drainage from pits while work is in progress and until pit is properly backfilled.

.05 AUGERING (BORING)

A. Auger from approved pit locations. Excavate for pits and install shoring as outlined above under Paragraph 3.04, Pits. Auger mechanically with use of pilot hole entire length of crossing and check for line and grade. Diameter of auger hole not to exceed pipe bell diameter plus 2 inches. Place excavated material outside working pit and dispose of as specified. Use water or other fluids in connection with boring operation only to lubricate cuttings; jetting is not permitted.

B. In unconsolidated soil formations, gel-forming colloidal drilling fluid may be used. Fluid is to consist of at least 10 percent of high-grade processed bentonite and shall consolidate cuttings of bit, seal walls of hole, and shall furnish lubrication for subsequent removal of cuttings and installation of pipe.

C. Depending on character of soil encountered during angering operation, conduct operations without interruption, insofar as practical, to prevent hole from collapsing or pipe from seizing up in hole before installation is complete.

D. Allowable variation from line and grade shall be as specified under Paragraph 3.08, Jacking.

E. Remove and replace pipe damaged in angering operations.

.06 AUGERING OF CASING

A. Provide jacks, mounted on frame or against backstop, of capacity suitable for forcing excavating auger and casing through soil conditions to be encountered. Operate jacks so that even pressure is applied to casing.

B. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing.

C. Bentonite slurry may be used to lubricate casing during installation. Use of water to facilitate removal of spoil and to lubricate exterior casing is permitted; however, water jetting for excavation of soil is not allowed when jacking casing.

D. Tolerances from lines and grades shown on Drawings for gravity sewer pipe installed in casing are plus or minus 6 inches in horizontal alignment, and plus or minus 1-1/2 inches in elevation.

.07 FILLING ANNULAR SPACE

A. For installation of water line, block void space around pipe in augered hole with approximately 12 inches of packed clay or approved equal material to prevent bedding or backfill from entering void around pipe in angered hole when

compacted. For pipe diameters 4 inches through 8 inches use minimum 1/2-cubic-foot clay; for pipe diameters 12 inches through 16 inches use minimum 3/4-cubic-foot clay.

.08 JACKING

A. For all pits, end trenches, and other excavations relating to work required by specifications, dewater as required to provide safe working conditions.

B. Wherever end trenches are cut into sides of embankment or beyond it, sheath securely and brace such work to prevent earth caving.

C. Make up only one joint at time in pit or trench prior to jacking.

D. Do not interfere with operation of railroad, street, highway, or other facility, nor to weaken or damage embankment or structure.

E. Use heavy-duty jacks sized for forcing casing through embankment. Use appropriate jacking head, usually of timber, and bracing between jacks and jacking head and jacking frame or backstop. Apply jacking pressure uniformly around ring of casing. Set casing to be jacked on guides, properly braced together, to support section of casing and to direct it in proper line and grade. Place jacking assembly in line with direction and grade of casing. Excavate embankment material just ahead of casing and remove material through casing. Force casing through embankment with jacks into excavated auger hole.

F. Conform excavation for underside of casing to contour and grade of casing, for at least one third of circumference of casing. Provide clearance of not more than 2 inches for upper half of casing. Taper off upper clearance to zero at point where excavation conforms to contour of casing.

G. Excavation may extend beyond end of casing depending on character of material, but shall not exceed 2 feet. Decrease advance excavation at direction of Project Manager, when character of material being excavated makes it desirable to keep advance excavation closer to end of casing.

H. Jack casing from low or downstream end. Lateral or vertical variation in final position of casing from line and grade as shown on Drawings will be permitted only to extent of 1 inch in 10 feet, provided such variation is regular and only in one direction and that final grade of flow line is in direction indicated on Drawings.

I. Use cutting edge of steel plate around head end of casing extending short distance beyond end of casing with inside angles or lugs to keep cutting edge from slipping back onto casing.

J. Once jacking of casing is begun, carry on without interruption, insofar as practicable, to prevent casing from becoming firmly set in embankment.

K. Remove and replace casing damaged in jacking operations.

L. Backfill pits or trenches excavated to facilitate jacking operations immediately after completion of jacking of casing.

M. Grout annular space between casing and excavated hole when loss of embankment occurs or when clearance of 2 inches is exceeded.

.09 SPACER INSTALLATION

A. There must be no inadvertent metallic contact between casing and carrier pipe. Place spacers to ensure that carrier pipe is adequately supported throughout length, particularly at ends, to offset settling, and possible electrical shorting unless otherwise approved by AW. Place end spacer within 6 inches of end of casing pipe, regardless of size of casing and carrier pipe or type of spacer used. Spacing between spacers depends largely on load bearing capabilities of pipe coating and flexibility of pipe.

B. Grade bottom of trench adjacent to each end of casing to provide firm, uniform, and continuous support for carrier pipe. When trench requires some backfill to establish final trench bottom grade, place backfill material in 6-inch lifts and compact to density of undisturbed soil.

C. Install casing spacers in accordance with manufacturer's instructions. Take special care to ensure that sub-components are correctly assembled and evenly tightened, and that no damage occurs during tightening of insulators or carrier pipe insertion.

D. Seal annulus between carrier pipe and casing with casing end seals at each end of casing.

E. Insulator Spacing:

1. Spacing shall be as shown on Drawing with maximum distance between spacers to be 10 feet for pipe sizes 4 to 14 inches and 8 feet for pipe sizes 16 to 30 inches.

2. For ductile iron pipe or bell-and-spigot pipe, install spacers within one foot on each side of bell or flange and one in center of joint when 18- to 20-foot-long joints are used.

3. If casing or carrier pipe is angled, bent, or dented, reduce spacing as directed by AW Project Manager. Provide casing with smooth, continuous interior surface.

.010 SETTLEMENT MONITORING

A. Monitor ground surface elevation along length of angering operation. Locate and record settlement monitoring points with respect to construction baseline and elevations. Record elevations to accuracy of 0.01 feet for each monitoring point location.

1. Railroads: Track sub base at centerline of each track.

2. Product pipelines: Directly above and 10 feet before and after pipeline intersection.

B. Reading Frequency and Reporting. Take settlement survey readings:

1) Prior to auger excavation reaching point
2) After auger reaches monitoring point in plan

3) After grouting of ground supporting casing is complete

C. Immediately report to AW Project Manager movement, cracking, or settlement which is detected.

D. Following substantial completion but prior to final completion, make final survey of monitoring points.

.011 DISPOSAL OF EXCESS MATERIAL

A. Conform to applicable provisions of Contract Documents.

END OF SECTION

SECTION 02448

PIPE AND CASING AUGERING FOR SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of casing for sewer pipe by dry augering or slurry boring methods, together with installation of sewer pipe in casing.

B. Installation of sewer pipe by slurry boring methods. Construction casing may be used at Contractor's option.

1.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Casing, including sewer pipe, installed by augering methods in mid-run of open cut segments where shown on Drawings, will be measured and paid by linear foot from end to end of casing. Casing may be installed, at Contractor's option, at locations other than shown on Drawings, at no additional cost to AW.
2. Sewer pipe installed by augering method in mid-run of open-cut segments where shown on Drawings, will be measured and paid by linear foot from end to end of augered section.
3. Pipe or casing segments installed by augering methods in locations other than mid-ran of open cut segments and shown on Drawings, will be measured and paid by linear foot along centerline of completed sewer from centerline to centerline of manholes to ends of stubs or termination of pipe, and to inside face of lift stations and other structures.
4. Payment will include and be full compensation for labor, equipment, materials and supervision for excavation and construction of sewer, complete in place including disposal of excess materials, shoring, dewatering, utility adjustments, grouting, backfill, clean-up, and other related work necessary for construction as indicated on Drawings and specified in this Section.
5. Cost for pits and other excavations are included in unit price for pipe with or without casing.
6. Cost for trench safety systems for pits are included in unit price for pipe with or without casing.
7. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 DEFINITIONS

A. Augering means either "dry angering" or "slurry angering".

B. Dry augering is jacking casing while excavating soil at heading and transporting spoil back through casing by otherwise uncased auger.

C. Slurry Auger Method: Installation of casing or pipe by first drilling small diameter pilot hole from shaft to shaft, followed by removing excess soil and installing pipe or conduit by pull back or jacking method.

1.04 REFERENCE STANDARDS

A. American Railway Engineering and Maintenance-of Way Association (AREMA) Manual for Railway Engineering.

B. American Association of State Highway and Transportation Officials (AASHTO).

1.05 REGULATORY REQUIREMENTS

A. Conform to State Department of Highways and Public Transportation for installations under state highways. AW will obtain required permits for State Highway crossings.

B. Installations under Railroads:

1. Secure and comply with requirements of right-of-entry for crossing railroad company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements.
2. Use dry auger method only.
3. Damages due to delays caused by railroad requesting work to be done at hours which will not inconvenience the railroad will be at no additional cost to AW.
4. Maintain minimum 35-foot clearance from centerline of tracks.

1.06 SUBMITTAL

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. For installation by augering, submit for review:

1. Description of mechanized excavating equipment.
2. Method of controlling line and grade.
3. Grouting techniques to be used for filling annular void between sewer pipe and casing, and void between sewer pipe or casing and ground, including equipment, pumping and injection procedures, pressure grout types, and mixes.
4. Locations and dimensions of pits.
5. Pit design and construction drawings.
6. Identification of casings required and paid under Contract and casings installed at

Contractor's option.

7. Design of casings.
8. Copy of railroad company permits and right-of-entry.

C. Prepare auger pit and casing design submittals that are site specific. Have auger pit and casing design submittals signed and sealed by a qualified Professional Engineer registered in the State where the project is being completed

D. Include in construction phase submittals:

1. Daily logs of augering and boring operations.
2. Settlement monitoring data to meet requirements of paragraph 3.05, Settlement Monitoring.
3. Submit daily logs and settlement monitoring data within 5 days after day of observation.

1.07 CRITERIA FOR DETERMINING CASING INSTALLATION LOADS

A. Select and design casing pipe and pipe joints to carry thrust of jacks or loads due to pulling mechanism in combination with overburden, earth and hydrostatic loads. Select casings for dry augering to withstand action of auger without damage.

B. Use Professional Engineer registered in the state where the project is being completed to determine design stresses, design deflections and factors of safety for design of casing. Present such determination as part of design submittal. Apply the following maximum casing pipe stresses and deflections to casings shown on Drawings:

1. Design stress in pipe wall: 50 percent of minimum yield point of steel or 18,000 psi, whichever is less, when subjected to applicable loading conditions.
2. Wall thickness: Maximum allowable deflection which does not exceed 3 percent of nominal casing diameter.

C. Use Cooper E-80 locomotive loading distributions as criteria for railroad crossings in accordance with AREMA specifications for culverts. In design, account for additive loadings due to multiple tracks.

D. Use H-20 vehicle loading distributions as criteria for truck loading in accordance with AASHTO.

E. When not specifically indicated on Drawings, select casing diameter to permit practical installation (including skids when applicable) and grouting.

PART 2 PRODUCTS

2.01 MATERIAL

A. Provide casing pipe which is straight, circular in section, uncoated, welded steel pipe, in accordance with Section 02502 - Steel Pipe and Fittings.

B. Provide sewer pipe in accordance with Section 02531 - Gravity Sanitary Sewers. Do not use high density polyethylene pipe for augering.

C. Provide restrained joint sewer pipe when installing sewer pipe in slurry bored holes by pullback method.

D. Supply grout as specified.

PART 3 EXECUTION

3.01 LOCATION AND SIZE OF AUGER PITS

A. Show location of auger pits on auger pit construction drawings. Locate auger pits for slurry boring so that distance between pits is no greater than 80 feet; and for dry augering not more than 120 feet apart.

B. Locate auger pits and associated work areas to avoid blocking driveways and cross streets and to minimize disruption to business and commercial interests. Avoid auger pit locations near areas identified as potentially contaminated.

C. Make size adequate for construction of structures indicated on Drawings. Provide adequate room to meet Contractor's operational requirements for augering.

D. Provide portable concrete traffic barrier around periphery of pit, meeting applicable safety standards. Properly maintain barrier throughout period pit remains open. Angle traffic barriers in direction of lane flow; do not place barriers perpendicular to on-coming traffic.

E. Provide full cover or other security fencing for each access pit in which there is no construction activity or which is unattended by Contractor's personnel.

3.02 DRY AUGERING OF CASING

A. Provide jacks, mounted on frame or against backstop, of capacity suitable for forcing excavating auger and casing through soil conditions to be encountered. Operate jacks so that even pressure is applied to casing.

B. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing.

C. Bentonite slurry may be used to lubricate casing during installation. Use of water to facilitate removal of spoil is permitted; however, water jetting for excavation of soil is not allowed when jacking casing.

D. Tolerances from lines and grades shown on Drawings for gravity sewer pipe installed in casing are plus or minus 6 inches in horizontal alignment, and plus or minus 1-1/2 inches in elevation.

3.03 SLURRY BORING OF CASING OR PIPE

A. Drill small diameter pilot hole and check for line and grade at receiving end. Redrill pilot hole when bored pipe does not meet specified tolerances.

B. Using pilot hole as guide bore larger diameter hole of sufficient size for pipe or casing installation. Water jetting is not permitted.

C. Bentonite slurry may be used to maintain stable hole and furnish lubrication for pipe or casing installation.

D. Tolerances from lines and grades shown on Drawings for installed sewer pipe are plus or minus 6 inches in horizontal alignment and plus or minus 1-1/2 inches in elevation.

E. Completely fill annular space between sewer pipe and surrounding soil or casing with grout, without displacing pipe during grouting operation.

3.04 SEWER PIPE IN CASING

A. Grout annular void between sewer pipe and casing from end to end of casing. Block and brace sewer pipe to prevent movement during grout placement and to maintain specified line and grade.

3.05 SETTLEMENT MONITORING

A. Monitor ground surface elevation along length of augering operation. Locate and record settlement monitoring points with respect to construction baseline and elevations. Record elevations to accuracy of 0.01 feet for each monitoring point location. Establish monitoring points at locations and by methods that protect them from damage by construction operations, tampering, or other external influences. As minimum, locate survey points as follows:

1. For road crossings: Centerline and each shoulder
2. Railroads: Track subbase at centerline of each track
3. Utilities and Pipelines: Directly above and 10 feet before and after utility or pipeline intersection
4. Long bores under improved areas such as pavements: Ground surface elevations must be recorded on centerline ahead of augering operations at locations not to exceed 50 feet apart (including points located for roads, railroads, utilities, and pipelines), or at least three locations per augering drive

B. Reading Frequency and Reporting. Take settlement survey readings:

1. Prior to auger excavation reaching point
2. After auger reaches monitoring point in plan
3. After grouting of ground supporting pipe or casing is complete

C. Immediately report to AW Project Manager movement, cracking, or settlement which is detected.

D. Following substantial completion but prior to final completion, make final survey of monitoring points.

3.06 DISPOSAL OF EXCESS MAIERIAL

A. Remove and dispose of spoil from job site in accordance with contract specification requirements.

3.07 LEAKAGE TESTING

A. Test sanitary sewers for leakage by low pressure air methods in accordance with Section 02533 - Acceptance Testing for Sanitary Sewer.

END OF SECTION

SECTION 02501

DUCTILE IRON PIPE AND FITTINGS

PART1 GENERAL

1.01 SECTION INCLUDES

A. Ductile iron pipe and fittings for watermains, wastewater force mains, gravity sanitary sewers, and storm sewers.

B. Related Sections:

1. Section 02511 - Watermains
2. Section 02531 - Gravity Sanitary Sewers
3. Section 02532 - Sanitary Sewage Force Mains

1.02 REFERENCES

A. ANSI A 21.4 (AWWA C 104) - Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings, for Water.

B. ANSI A 21.10 (AWWA C 110) - Standard for Ductile-Iron and Gray-Iron Fittings, 3-in. through 48-in.

C. ANSI A 21.11 (AWWA C 111) - Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

D. ANSI A 21.15 (AWWA C 115) - Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.

E. ANSI A21.16 (AWWA C 116) - Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey iron Fittings for Water Supply Service.

F. ANSI A 21.50 (AWWA C 150) - Standard for Thickness Design of Ductile-Iron Pipe.

G. ANSI A 21.51 (AWWA C 151) - Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water and Other Liquids.

H. ANSI A 21.53 (AWWA C 153) - Standard for Ductile Iron Compact Fittings,3 inches through 24 inches and 54 inches through 64 inches for Water Service.

I. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

J. ASTM D 1248 - Standard Specification Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable.

K. ASTM F 477 - Elastomeric Seals (gaskets) for Joining Plastic Pipe.

L. ASTM G 62 - Standard Test Methods for Holiday Detection in Pipeline Coatings.

M. AWWA C 102 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

N. AWWA C 300 - Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and other Liquids.

O. AWWA C 600 - Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.

P. SSPC-SP 6 - Steel Structures Painting Council, Commercial Blast Cleaning.

Q. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.

R. American Association of State Highway Transportation Officials (AASHTO).

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. For pipes 16 inches and greater submit shop drawings signed and sealed by Professional Engineer registered in the State where the project is being completed showing the following:

1. Manufacturer's pipe design calculations.

2. Provide lay schedule of pictorial nature indicating alignment and grade, laying dimensions, fitting, flange, and special details, with plan view of each pipe segment sketched, detailing pipe invert elevations, horizontal bends, restrained joints, and other critical features. Indicate station numbers for pipe and fittings corresponding to Drawings. Do not start production of pipe and fittings prior to review and approval by Contracting Officer. Provide final approved lay schedule on CD-ROM in Adobe portable document format (*.PDF).

3. Calculations and limits of thrust restraint.

4. Class and length of joint.

C. Submit manufacturer's certifications that ductile iron pipe and fittings meet provisions of this Section and have been hydrostatically tested at factory and meet requirements of ANSI A21.51.

D. Submit certifications that pipe joints have been tested and meet requirements of ANSI A 21.11.

E. Submit affidavit of compliance in accordance with ANSI A21.16 for fittings with fusion bonded epoxy coatings or linings.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile Iron Pipe Barrels: ANSI A 21.15, ANSI A 21.50 or ANSI A 21.51; bear mark of Underwriters' Laboratories approval; minimum thickness Class 51 for watermains and thickness Class 52 for sanitary sewers, or as shown on Drawings. Provide minimum thickness Class 53 for flanged pipe.

B. Provide pipe sections in standard lengths, not less than 18 feet long, except for special fittings and closure sections as indicated on shop drawings.

C. Modify pipe for cathodic protection in accordance with Cathodic Protection for Pipelines. In lieu of furnishing ductile iron pipe with cathodic protection system, furnish ductile iron pipe with polyethylene encasement, provided the following criteria is met:

1. Provide minimum thickness class.

2. Provide polyethylene encasement material and installation in accordance with AWWA C105, and backfill as specified. Minimum of two complete wraps of 8-mil-thick polyethylene.

3. Use polyethylene encasement for open cut installations only. For augered sections or sections installed inside a casing, provide coating in accordance with paragraph 2.05 D.1.

4. Adhere to other requirements specified herein (e.g., insulation kits, etc.).

D. For use of pressure class pipe for watermains, design pipe and fittings to withstand most critical simultaneous application of external loads and internal pressures. Base design on minimum of AASHTO HS-20 loading and depths of bury as indicated on Drawings. Design pipes with Marston's earth loads for a transition width trench for zero to 16 feet of cover. Use Marston's earth loads for a trench width of O.D. (of pipe) + 4 feet for pipe greater than 16 feet of cover. Use Marston's equations for a trench condition in both open-cut and

tunnel applications. Design for most critical groundwater level condition. Pipe design conditions:

1. Working pressure = 100 psi.
2. Hydrostatic field test pressure = 150 psi.
3. Maximum pressure due to surge = 150 psi.
4. Minimum Pressure due to surge = 5 psi.
5. Design tensile stress due to surge or hydrostatic test pressure: No greater than 50% minimum yield.
6. Design bending stress due to combined earth loads and surge or hydrostatic test pressure: No greater than 48,000 psi.
7. Unit weight of fill $\geq$ 120 pcf.
8. Deflection lag factor (DI) = 1.2.
9. Bedding constant (K) = 0.1.
10. Moment coefficient = 0.16.
11. Fully saturated soil conditions hw=h=depth of cover above top of pipe.

E. Hydrostatic Test of Pipe: AWWA C 151, Section 5.2.1, at point of manufacture. Hold test for a minimum 2 minutes for thorough inspection of pipe. Repair or reject pipe revealing leaks or cracks.

F. Pipe Manufacturer for large diameter watermains: Minimum of 5 years of successful pipe installations in continuous service. Manufacturer must maintain on site or in plant enough fittings to satisfy the following requirements:

Line Diameter	Required Bends*
20 and 24 inches	Four 45º bends per 5,000 LF of water line
>24 inches	Four 22.5º bends per 10,000 LF of water line
*Based on total length of contract (minimum of four). Any combination of bends may be substituted at manufacturer's option (i.e., Two 22 ½ º bends are equivalent to one 45º bend) and will be counted as one fitting.	

G. Provide flange adapter with insulating kit as required when connecting new piping to existing piping and piping of different materials, unless otherwise approved by AWS Project Manager.

H. Clearly mark pipe section to show location and thickness/pressure class color coded.

2.02 JOINTS

A. Joint Types: ANSI A 21.11 push-on; ANSI A 21.11 mechanical joint; or ANSI A 21.16 flanged end. Provide push-on joints unless otherwise indicated on the Drawings or required by these specifications. For bolted joints, conform to requirements of AWWA C111; provide minimum 304 stainless steel for restraint joints.

B. Where required by Drawings, provide approved restrained joints for buried service.

C. Threaded or grooved-type joints which reduce pipe wall thickness below minimum required are not acceptable.

D. Provide for restrained joints designed to meet test pressures required under Hydrostatic Testing of Pipelines or Section 02532 - Sanitary Sewer Force Mains, as applicable. Provide restrained joints for test pressure or maximum surge pressure as specified, whichever is greater for water lines. Do not use passive resistance of soil in determining minimum restraint lengths.

E. Bond rubber gasketed joints to provide electrical continuity along entire pipeline, except where insulating flanges are required by Drawings.

F. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer for pipe joints or restraint joints. Submit details of other methods of providing curves and bends for consideration by Contracting Officer. When other methods are deemed satisfactory, install at no additional cost to Government.

2.03 GASKETS

A. Furnish, when no contaminant is identified, plain rubber (SBR) gasket material in accordance with ANSI A21.11 or ASTM F 477 (One Bolt only); for flanged joints 1/8-inch-thick gasket in accordance with ANSI A 21.15.

2.04 FITTINGS

A. Use fittings of same size as pipe. Reducers are not permitted to facilitate an of size fitting. Reducing bushings are also prohibited. Make reductions in piping size by reducing fittings. Line and coat fittings as specified for pipe they connect to.

B. Push-on Fittings: ANSI A 21.10; ductile iron ANSI A 21.11 joints, gaskets,and lubricants; pressure rated at 250 psig.

C. Flanged Fittings: ANSI 21.10; ductile iron ANSI A 21.11 joints, gaskets, and lubricants; pressure rated at 250 psig.

D. Mechanical Joint Fittings: ANSI A 21.11; pressure rated at 250 psi.

E. Ductile Iron Compact Fittings for Water lines: ANSI A 21.53; 4 inch through 12 inch diameter fusion bonded epoxy-lined or cement mortar lining.

2.05 COATINGS AND LININGS

A. Watermain Interiors: ANSI A21.4, cement lined with seal coat; comply with NSF 61.

B. Sanitary Sewer and Force Main Interiors:

1. Preparation: Commercial blast cleaning conforming to SSPC-SP6.

2. Liner thickness: Nominal 40 mils, for pipe barrel interior; minimum 6 to 10 mils at gasket groove and outside spigot end to 6-inches back from end.

3. Testing: ASTM G 62, Method B for voids and holidays; provide written certification.

4. Acceptable Lining Materials:

a. Provide approved virgin polyethylene conforming to ASTM D 1248, with inert fillers and carbon black to resist ultraviolet degradation during storage; heat bonded to interior surface of pipe and fittings.

b. Ceramic Epoxy - Protecto 401.

C. Sanitary Sewer Point Repair Pipe: For pipes which will be lined with high density polyethylene liner pipe or cured-in-place liner, provide cement-lined with seal coat in accordance with ANSI A 21.4. For pipes which will not be provided with named liner, provide pipe as specified in Paragraph 2.05B, Sanitary Sewer and Force Main Interiors.

D. Exterior:

1. Watermains

a. Above Ground (or Exposed): Conform to requirements of Section 02502 - Steel Pipe and Fittings, Paragraph 2.03.

b. Tunnel, Casing or Direct Bury: Conform to requirements of Paragraph 2.05E.

2. Sanitary Sewers: Prime coat and outside asphaltic coating conforming to ANSI A21.10, ANSI A21.15, or ANSI A21.51 for pipe and fittings in open cut excavation and in casings.

E. Polyethylene Wrap: For buried pipes not cathodically protected, provide polyethylene wrap unless otherwise specified or shown. Conform to requirements of Section 02528 - Polyethylene Wrap.

F. For flanged joints in buried service, provide petrolatum wrapping system, Denso, or equal, for the complete joint and alloy steel fasteners. Alternatively, provide bolts made of Type 304 stainless steel.

G. Pipe to be installed in potentially contaminated areas shall have coatings and linings recommended by the manufacturer for maximum resistance to the contaminants identified in the documents or as indicated by Ft. Sill DPW Environmental office.

H. For water lines cathodically protected, supply ductile iron pipe with either tape coatings or some other bonded dielectric coating.

2.06 MANUFACTURERS

A. Use pre-approved manufacturers listed in approved products of the contract document.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conform to installation requirements of Sections 02511 - Watermains, 02531 - Gravity Sanitary Sewers, and 02532 - Sanitary Sewer Force Mains, except as modified in this Section.

B. Install in accordance with AWWA C 600 and manufacturer's recommendations.

C. Install all ductile iron pipe in double polyethylene wrap, unless cathodic protection is provided. Do not use polyethylene wrap with a cathodic protection system.

D. Holiday Testing.

1. Polyurethane: Polyurethane Coatings for Steel or Ductile Iron Pipe.

2. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A 21.16. 3.02 FIELD REPAIR OF COATINGS

A. Polyurethane: Provide Polyurethane Coatings for Steel or Ductile Iron Pipe.

B. Fusion Bonded Epoxy: Conform to requirements for new fittings in ANSI A 21.16.

END OF SECTION

SECTION 02503

COPPER TUBING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Copper tubing for water service lines.

1.02 REFERENCES

A. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.

B. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certified test results of ASTM B 88.

C. Submit manufacturer's testing certification that copper tubing conforms to requirements of ASTM B 88. Number of samples for testing of each size of tubing is modified as follows:

1. For each 7500 feet of tubing: 1 sample

2. For each set of tubing less than 7500 feet: 1 sample

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide Type K annealed, seamless, copper tubing, 3/8 inch to 2 inch in diameter conforming to requirements of ASTM B 88.

B. Provide 3/8-inch and 1-inch tubing in coils of minimum 60 feet in length, and 1 ½ inch and 2-inch tubing in coils 40 feet in length.

C. Provide tubing manufactured in United States of America. Tubing shall be inspected and tested by a certified laboratory approved by Contracting Officer at point of manufacture or locally. Furnish tubing, at no additional cost to designated testing laboratory along with mill compliance certificates.

D. Provide flared or compression-type brass fittings for use with Type K annealed copper tubing in accordance with AWWA C 800.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conform to installation requirements of Section 02512 - Water Tap and Service Line Installation, except as modified in this Section.

3.02 JOINTS

A. Minimum joint spacing for 3/4-inch and 1-inch tubing shall be 60 feet and for 1 ½ inch and 2-inch tubing shall be 40 feet.

B. Cut copper tubing squarely by using cutting tools designed specifically for purpose and avoid procedures that cause pipe to bend or pipe walls to flatten.

C. After tubing has been cut, but before flaring, use reamer to remove inside rolled lip from tubing. Expand flared ends by use of flaring tool using care to avoid splitting, crimping, or over stressing metal. Provide at least 10 inches of straight pipe adjacent to fittings.

D. When compression fittings are used, cut copper tubing squarely prior to insertion into fitting. Assemble in accordance with manufacturer's recommended procedure.

3.03 BENDS

A. Bend tubing by using appropriate sized bending tool. No kinks, dents, flats, or crimps shall be permitted. Cut out and replace damaged section. Install no bends with radius smaller than radius of coil of tubing as packaged by manufacturer. Copper tubing shipped in straight lengths conforms to the following:

1. For 2-inch diameter: Maximum of one 45-degree bend per 4-foot section.

2. For 1 1/2-inch diameter: Maximum of one 45-degree bend per 3-foot section.

END OF SECTION

SECTION 02505

HIGH DENSITY POLYETHYLENE (HDPE) SOLID AND PROFILE WALL PIPE

PART 1 GENERAL

.01 SECTION INCLUDES

A. High density polyethylene (HDPE) pipe for gravity sewers and drains, including fittings.

B. High density polyethylene (HDPE) pipe for sanitary sewer forcemains, including fittings.

C. High density polyethylene (HDPE) pipe for storm sewers culverts.

.02 REFERENCES

A. AASHTO M 294 - Standard Specification for Corrugated Polyethylene Drainage Pipe, 18"- 48" diameter.

B. AASHTO Section 18 - Soil Thermoplastic Pipe Interaction Systems.

C. AASHTO Section 30 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity Flow Applications.

D. ASTM D 618 - Standard Practice for Conditioning Plastics for Testing.

E. ASTM D 1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

F. ASTM D 2321 - Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Pipe.

G. ASTM D 2657 - Standard Practice for Heat Fusion Joining Polyethylene Pipe and Fittings.

H. ASTM D 2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

I. ASTM D 3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.

J. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

K. ASTM D 3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

L. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

M. ASTM F 714 - Standard Specification for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.

N. ASTM F 894 - Standard Specification for Polyethylene (PE) Large-Diameter Profile Wall Sewer and Drain Pipe.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit shop drawings showing design of pipe and fittings, laying dimensions, fabrication, fittings, flanges, and special details.

.04 QUALITY CONTROL

A. Provide manufacturer's certificate of conformance to Specifications.

B. Furnish pipe and fittings that are homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. Provide pipe as uniform as commercially practical in color, opacity, density, and other physical properties.

C. Contracting Officer reserves right to inspect pipes or witness pipe manufacturing. Inspection shall in no way relieve manufacturer of responsibilities to provide products that comply with applicable standards and these Specifications.

1. Manufacturer's Notification: Should Contracting Officer wish to witness manufacture of specific pipes, manufacturer shall provide Contracting Officer with minimum three weeks notice of when and where production of those specific pipes will take place.

2. Failure to Inspect. Approval of products or tests is not implied by Contracting Officer's decision not to inspect manufacturing, testing, or finished pipes.

.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with documented experience of minimum 5 years of pipe installations that have been in successful, continuous service for same type of service as proposed Work.

PART 2 PRODUCTS

.01 GENERAL

A. For sewer pipe provide HDPE pipe as follows:

1. NEW CONSTRUCTION PIPE PRODUCTS GRAVITY SANITARY SEWER DIRECT BURY

Installation Spec No.	Generic Name	Trade Name or Manufacturer	ASTM	SDR (Numeric Maximum)	Pipe Stiffness (Numeric Minimum	Size Range
02550	Solid Wall Poly	Chevron Plexco Quail Poly Pipe AmeriFlow by NAPCO AmeriFlow by KWH	F-714	DR 21	46	8” – 48” 3” – 12” 14” – 63”
02550	Polyethylene Profile Wall	Spirolite	F-894	n/a	46	18” – 120”

2. REHABILITATION CONSTRUCTION PIPE PRODUCTS SLIPLINING OF SANITARY SEWER

Installation Spec No.	Generic Name	Trade Name or Manufacturer	ASTM	SDR (Numeric Maximum)	Pipe Stiffness (Numeric Minimum)	Size Range
02550	Solid Wall Poly	Chevron Plexco Quail Poly Pipe AmeriFlow by NAPCO AmeriFlow by KWH	F-714	DR 21	46	8” – 48” 3” – 12” 14” – 63”
02550	Polyethylene Profile Wall	Spirolite	F-894	n/a	46	18” – 120”

B. For Residential Driveway Culverts provide HDPE as follows:

1. N-12 and N-12 HC by Advanced Drainage Systems, Inc. (ADS).
2. Sure-Lok F477 by Hancor, Inc.
3. Or approved equal.

C. Furnish solid wall pipe with plain end construction for heat joining (butt fusion) conforming to ASTM D 2657. Utilize controlled temperatures and pressures for joining to produce fused leak-free joint.

D. Furnish profile-wall gravity sewer pipe with bell-and-spigot end construction conforming to ASTM D 3212. Joining will be accomplished with elastomeric gasket in accordance with manufacturer's recommendations. Use integral bell-and-spigot gasketed joint designed so that when assembled, elastomeric gasket, contained in machined groove on pipe spigot, is compressed radially in pipe bell to form positive seal. Design joint to avoid displacement of gasket when installed in accordance with manufacturer's recommendations.

E. Furnish solid wall pipe for sanitary sewer force mains with minimum working pressure rating of 150 psi, and with inside diameter equal to or greater than nominal pipe size indicated on Drawings.

F. Furnish corrugated polyethylene pipe (CPP) for gravity storm sewer pipe. Joints shall be installed such that connection of pipe sections will form continuous line free from irregularities in flow line. Suitable joints are:

1. Integral Bell and Spigot. Bell shall overlap minimum of two corrugations of spigot end when fully engaged.
2. Exterior Bell and Spigot. Bell shall be fully welded to exterior of pipe and overlap spigot end so that flow lines and ends match when fully engaged.

G. Jointing:

1. Gaskets:

a. Meet requirements of ASTM F 477. Use gasket molded into circular form or extruded to proper section and then spliced into circular form. When no contaminant is identified, use gaskets of properly cured, high-grade elastomeric compound. Basic polymer shall be natural rubber, synthetic elastomer, or blend of both,

b. Pipes allowed to be installed in potentially contaminated areas, where free product is found near elevation of proposed sewer, shall have the following gasket materials for noted contaminants:

CONTAMINANT	GASKET MATERIAL REQUIRED
Petroleum (diesel, gasoline)	Nitrite Rubber
Other Contaminants	As recommended by pipe manufacturer

2. Lubricant. Use lubricant for assembly of gasketed joints which has no detrimental effect on gasket or on pipe, in accordance with manufacturer's recommendations.

.02 MATERIALS FOR SANITARY SEWER

A. Pipe and Fittings: High density, high molecular weight polyethylene pipe material meeting requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248. Material meeting requirements of cell classification in accordance with ASTM D 3350 are also suitable for making pipe products under these specifications.

B. Other Pipe Materials: Materials other than those specified in Paragraph 2.02A, Pipe and Fittings, may be used as part of profile construction, e.g., as core tube to support shape of profile during processing, provided that these materials are compatible with base polyethylene material and are completely encapsulated in finished product and in no way compromise performance of pipe products in

intended use. Examples of suitable material include polyethylene and polypropylene.

.03 MATERIALS FOR RESIDENTIAL DRIVEWAY CULVERTS

A. Pipe and Fittings: High density, high molecular weight polyethylene HDPE virgin compound material meeting requirements of cell class outlined in AASHTO M 294, AASHTO MP7 and ASTM D 3350.

B. Types: CPP shall meet one or both of following:

1. Type S: Outer corrugated wall with smooth inner liner.
2. Type D: Inner and outer smooth walls braced circumferentially or spirally with projections or ribs.

C. Lubricant: Use lubricant for assembly of gasketed joints, which has no detrimental effect on gasket or on pipe, in accordance with manufacturer's recommendations.

.04 TEST METHODS FOR SANITARY SEWER

A. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Contracting Officer. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

B. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.05A, in suitable press until internal diameter has been reduced to 40 percent of original inside diameter of pipe. Rate of loading shall be uniform and at 2 inches per minute. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles.

C. Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except replace shear load transfer bars and supports with 6-inch-wide support blocks that can be either flat or contoured to conform to pipe's outer contour.

D. Purpose of Tests. Flattening and joint tightness tests are not intended to be routine quality control tests, but rather to qualify pipe to a specified level of performance.

.05 TEST METHODS FOR RESIDENTIAL DRIVEWAY CULVERTS

A. Pipe stiffness at 5 percent deflection, when determined in accordance with ASTM D 2412, shall be as specified in Section 7.4 of AASHTO M 294.

B. Minimum inner wall thickness shall be as specified in Section 7.2.2 of AASHTO M 294.

.06 MARKING

A. Mark each standard and random length of pipe in compliance with these Specifications with following information:

1. Pipe size.
2. Pipe class.
3. Production code.
4. Material designation.

PART 3 EXECUTION

.01 INSTALLATION

A. Conform to requirements of following Sections:

1. Section 02531 - Gravity Sanitary Sewers.
2. Section 02532 - Sanitary Sewage Force Mains.
3. Section 02533 - Acceptance Testing for Sanitary Sewers.

B. Install pipe in accordance with the manufacturers recommended installation procedures.

C. HDPE pipe is not approved in applications requiring auguring of pipe.

D. Bedding and backfill: Conform to requirements of Section 02317 - Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02506

POLYVINYL CHLORIDE PIPE

PART 1 GENERAL

.01 SECTION INCLUDES

A. Polyvinyl chloride pressure pipe for water distribution, in nominal diameters 4 inches through 16 inches.

B. Polyvinyl chloride sewer pipe for gravity sewers in nominal diameters 4 inches through 48 inches.

C. Polyvinyl chloride pressure pipe for gravity sewers and forcemains in nominal diameters 4 inches through 16 inches.

D. Related Sections:

1. Section 02511 -Watermains
2. Section 02531 - Gravity Sanitary Sewers
3. Section 02532 - Sanitary Sewer Forcemains

.02 REFERENCES

A. ANSI A 21.16 (AWWA C 116) - Protective Fusion Bonded Epoxy Coating for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply Service.

B. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

C. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

D. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

E. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

F. ASTM D 2444 - Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight).

G. ASTM D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.

H. ASTM D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

I. ASTM D 3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

J. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

K. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

L. ASTM F 679 - Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

M. ASTM F 794 - Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

N. ASTM F 949 - Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with Smooth Interior and Fittings.

O. AWWA C 110 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 Inches Through 48 Inches for Water.

P. AWWA C 111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

Q. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches for Water Distribution.

R. AWWA C 905 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., for Water Transmission and Distribution.

S. AWWA C 909 - Standard for Molecularly-Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 Inches through 12 Inches (100mm through 300 mm), for Water Distribution.

T. PPI TR3 - Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

U. UNI-B-13 - Recommended Standard Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride Pipe.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit shop drawings showing design of new pipe and fittings indicating alignment and grade, laying dimensions, fabrication, fittings, flanges, and special details.

.04 QUALITY CONTROL

A. Submit manufacturer's certifications that PVC pipe and fittings meet requirements of this Section and AWWA C 900, AWWA C 909 and AWWA C 905 for pressure pipe applications, or appropriate ASTM standard specified for gravity sewer pipe.

B. Submit manufacturer's certification that PVC pressure pipe for water lines and force mains has been hydrostatically tested at factory in accordance with AWWA C 900, AWWA C 909 and AWWA C 905, and this Section.

C. When foreign manufactured material is proposed for use, have material tested for conformance to applicable ASTM requirements by certified independent testing laboratory located in United States. Certification from other source is not acceptable. Furnish copies of test reports to Contracting Officer for review. Cost of testing paid by Contractor.

PART 2 PRODUCTS

.01 MATERIAL

A. Use PVC compounds in manufacture of pipe that contain no ingredient in amount that has been demonstrated to migrate into water in quantities considered to be toxic.

B. Furnish PVC pressure pipe manufactured from Class 12454-A or Class 12454-B virgin PVC compounds as defined in ASTM D 1784. Use compounds qualifying for rating of 4000 psi for water at 73.4 F per requirements of PPI TR3. Provide pipe which is homogeneous throughout, free of voids, cracks, inclusions, and other defects, uniform as commercially practical in color, density, and other physical properties. Deliver pipe with surfaces free from nicks and scratches with joining surfaces of spigots and joints free from gouges and imperfections which could cause leakage.

C. PVC Restrained Pipe: Must be listed on American Water’s (AW’s) current Product Approval List.

1. Pipe Material:

   a. DR 18: For restrained joints where shown on Drawings.

   b. DR 14: For alternate to offset pipe sections shown on Drawings. Do not use PVC for offset sections with depth of cover greater than 20 feet or less than 4 feet. Do not use PVC in potentially petroleum contaminated areas.

D. Water Service.

1. Provide self-extinguishing PVC pipe that bears Underwriters' Laboratories mark of approval and is acceptable without penalty to State Fire Insurance Committee for use in fire protection lines.

2. Bear National Sanitation Foundation Seal of Approval (NSF-PW).

E. Gaskets:

1. Gaskets shall meet requirements of ASTM F 477. Use elastomeric factory-installed gaskets to make joints flexible and watertight.

2. Flat Face Mating Flange: Full faces 1/8-inch-thick ethylene propylene (EPR) rubber.

3. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EDR) rubber,

with filler gasket between OD of raised face and flange OD to protect flange from bolting moment.

F. Lubricant for rubber-gasketed joints: Water soluble, non-toxic, non-objectionable in taste and odor imparted to fluid, non-supporting of bacteria growth, having no deteriorating effect on PVC or rubber gaskets.

G. Do not use PVC in potentially or known contaminated areas.

H. Do not use PVC in areas exposed to direct sunlight.

.02 WATER SERVICE PIPE

A. Pipe 4 inch through 12 inch: AWWA C 900, AWWA C 909, Class 150, DR 18; AWWA C 900, Class 200, DR 14 as alternate to offset pipe sections; nominal 20-foot lengths; cast-iron equivalent outside diameters.

B. Pipe 14 inch through 16 inch: AWWA C 905; Class 235; DR 18; nominal 20-foot lengths; cast-iron equivalent outside diameter.

C. Provide Polyvinyl Chloride Pipe from approved manufacturers.

D. Make curves and bends by deflecting joints. Do not exceed maximum deflection recommended by pipe manufacturer. Submit details of other methods of providing curves and bends for review by Contracting Officer.

E. Hydrostatic Test: AWWA C 900, AWWA C 905, AWWA C 909, ANSI A 21.10 (AWWA C 110); at point of manufacture; submit manufacturer's written certification.

.03 GRAVITY SEWER PIPE

A. PVC gravity sanitary sewer pipe and storm sewer pipe shall be in accordance with provisions in following table:

WALL CONSTRUCTION	**MANUFACTURER**	**ASTM DESIGNATION**	**SDR** (Max) **STIFFNESS (MIN.)**	**DIAMETER SIZE RANGE**
Solid	7-M Pipe CertainTeed Diamond Uponor ETI North American	D3034	SDR 26 IPS 115	6" to 10"
		D3034	SDR 35 IPS 46	12" & 15"
		F679	SDR 35 I PS 46	18" to 27"
		AWWA C900	DR 18 /NIA	4" to 12"
		AWWA C909	DR 181 NIA	4" to 12"
		AWWA C905	DR 18 /NIA	14" to 16"
Truss (Gasketed)	Contech	D2680	N/A /200 psi	8" to 15"
Profile	Contech A-2000	F949	N/A 146 psi	12" to 36"
	Contech A-2026	F949	N/A 1115 psi	8" to 10"
	ETI, Ultra-Rib	F794	N/A 146 psi	S" to 30"
	ETI, Ultra-Cory	F794	N/A 146 psi	24" to 36"

B. When solid wall PVC pipe 18 inches to 27 inches in diameter is required in SDR 26, provide pipe conforming to ASTM F 679, except provide wall thickness as required for SDR 26 and pipe strength of 115 psi.

C. For sewers up to 12-inch diameter crossing over water lines, or crossing under water lines with less than 2-feet separation, provide minimum 150 psi pressure rated pipe conforming to ASTM D 2241 with suitable PVC adapter couplings.

D. Joints: Spigot and integral wall section bell with solid cross section elastomeric or rubber ring gasket conforming to requirements of ASTM D 3212 and ASTM F 477, or ASTM D 3139 and ASTM F 477. Gaskets shall be factory-assembled and securely bonded in place to prevent displacement. Manufacturer shall test sample from each batch conforming to requirements ASTM D 2444

E. Fittings: Provide PVC gravity sewer sanitary bends, tee, or wye fittings for new sanitary sewer construction. PVC pipe fittings shall be full-bodied, either injection molded or factory fabricated. Saddle-type tee or wye fittings are not acceptable.

F. Conditioning. Conditioning of samples prior to and during tests is subject to approval by Contracting Officer. When referee tests are required, condition specimens in accordance with Procedure A in ASTM D 618 at 73.4 degrees F plus or minus 3.6 degrees F and 50 percent relative humidity plus or minus 5 percent relative

humidity for not less than 40 hours prior to test. Conduct tests under same conditions of temperature and humidity unless otherwise specified.

G. Pipe Stiffness. Determine pipe stiffness at 5 percent deflection in accordance with Test Method D 2412. Minimum pipe stiffness shall be 46 psi. For diameters 4 inches through 18 inches, test three specimens, each a minimum of 6 inches (150 mm) in length. For diameters 21 inch through 36 inch, test three specimens, each a minimum of 12 inch (300 mm) in length.

H. Flattening. Flatten three specimens of pipe, prepared in accordance with Paragraph 2.04F, in suitable press until internal diameter has been reduced to 60 percent of original inside diameter of pipe. Rate of loading shall be uniform. Test specimens, when examined under normal light and with unaided eye, shall show no evidence of splitting, cracking, breaking, or separation of pipe walls or bracing profiles. Perform the flattening test in conjunction with pipe stiffness test.

I. Joint Tightness. Test for joint tightness in accordance with ASTM D 3212, except that joint shall remain watertight at minimum deflection of 5 percent. Manufacturer will be required to provide independent third party certification for joint testing each diameter of storm sewer pipe.

J. Purpose of Tests. Flattening and pipe stiffness tests are intended to be routine quality control
tests. Joint tightness test is intended to qualify pipe to specified level of performance.

.04 SANITARY SEWER FORCE MAIN PIPE

A. Provide approved PVC pressure pipe conforming to requirements for water service pipe, and conforming to minimum working pressure rating specified in Section 02532 - Sanitary Sewer Forcemains.

B. Acceptable pipe joints are integral bell-and-spigot, containing a bonded-in elastomeric sealing ring meeting requirements of ASTM F 477. In designated areas requiring restrained joint pipe and fittings, use approved joint restraint device conforming to UNI-B-13, for PVC pipe 12-inch diameter and less.

C. Fittings: Provide approved ductile iron fittings as per Section 02501 - Ductile Iron Pipe and Fittings, Paragraph 2.04, except furnish fittings with one of following approved internal linings:

1. Nominal 40 mils (35 mils minimum) virgin polyethylene complying with ASTM D 1248, heat fused to interior surface of fitting
2. Nominal 40 mils (35 mils minimum) polyurethane
3. Nominal 40 mils (35 mils minimum) ceramic epoxy
4. Nominal 40 mils (35 mils minimum) fusion bonded epoxy

D. Exterior Protection: Provide polyethylene wrapping of ductile-iron fittings as required by Section 02528 - Polyethylene Wrap.

E. Hydrostatic Tests: Hydrostatically test pressure rated pipe in accordance with Paragraph 2.02E.

.05 BENDS AND FITTINGS FOR PVC PRESSURE PIPE

A. Bends and Fittings: ANSI A 21.10 or ANSI A 21.53, ductile iron; ANSI A 21.11 single rubber gasket push-on type joint; minimum 150 psi pressure rating. Approved restrained joints, 250 psi, may be provided for up to 12 inches in diameter (water or sanitary).

B. Provide approved restrained joint fittings: Integral restrained joint fittings and pipe do not require secondary restraint.

PART 3 EXECUTION

.01 PROTECTION

A. Store pipe under cover out of direct sunlight and protect from excessive heat or harmful chemicals in accordance with manufacturer's recommendations.

.02 INSTALLATION

A. Conform to requirements of Section 02511 - Watermains, Section 02531 - Gravity Sanitary Sewers, and Section 02532 - Sanitary Sewer Forcemains, as applicable.

B. Install PVC pipe in accordance with Section 02317 - Excavation and Backfill for Utilities, ASTM D 2321 for Sewer Pipe, and manufacturer's recommendations.

C. Install PVC water service pipe to clear utility lines and have minimum depth of cover below property line grade of street, unless otherwise required by Drawings:

1. Water service pipe 12 inches in diameter and smaller 4 feet of cover.
2. Water service pipe 16 inches in diameter and larger 5 feet of cover.

D. Avoid imposing strains that will overstress or buckle pipe when lowering pipe into trench.

E. Hand shovel pipe bedding under pipe haunches and along sides of pipe barrel and compact to eliminate voids and ensure side support.

F. Store PVC pipe under cover out of direct sunlight. Protect pipe from excessive heat or harmful chemicals. Prevent damage by crushing or piercing.

G. Allow PVC pipe to cool to ground temperature before backfilling when assembled out of trench to prevent pullout due to thermal contraction.

.03 PVC RESTRAINED MECHANISM

A. Do not apply lubricant to spline or pipe or coupling spline grooves.

B. Do not use excessive force while inserting the spline through coupling.

C. Insert spline until it is fully seated around circumference of pipe.

D. Field Cutting of Pipe Ends:

1. Perform by workers certified by manufacturer.
2. Use a PVC pipe cutter and provide square ends.
3. Use manufacturer approved power routing and grooving tool to field fabricate required pipe groove.

END OF SECTION

SECTION 02511

WATERMAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of watermains.
B. Specifications identify requirements for both small diameter watermains and large diameter watermains. When specifications for large diameter watermains differ from those for small diameter watermains, large diameter specifications will govern for large diameter pipe.

1.02 REFERENCES

A. ANSI A 21.11/AWWA C111 - Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

B. ANSI/NSF Standard 61 - Drinking Water System -Health Components.

C. ASTM A 36 - Standard Specification for Carbon Structural Steel

D. ASTM A 536 - Standard Specification for Ductile Iron Castings

E. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

F. ASTM B 21 - Standard Specification for Naval Brass Rod, Bar, and Shapes.

G. ASTM B 98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.

H. ASTM B 301 - Standard Specification for Free-Cutting Copper Rod and Bar.

I. ASTM B 584 - Standard Specification for Copper Alloy Sand Casting for General Application.

J. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination

K. ASTM E 709 - Standard Guide for Magnetic Particle Examination

L. ASTM F 1674 - Standard Test Method for Joint Restraint Products for Use with PVC Pipe.

M. AWWA C 206 - Standard for Field Welding of Steel Water Pipe.

N. AWWA C 207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 Inches through 144 Inches.

1.03 SUBMITTALS

A. Conform to the Section of Section 01300 - Submittal Procedures.

B. Conform to submittal requirements of applicable Section for type of pipe used.

C. Construction Photographs to be taken prior to commencement of construction with both the Contractor and the Contracting Officer to be present.

D. Submit videotapes conforming to requirements of Construction Videotapes, if applicable.

E. Submit proper notification transmittal number prior to beginning excavation.

F. Submit, a minimum of 15 days before beginning pipe laying operations, layout drawing identifying proposed sections for disinfecting, hydrostatic testing and site restoration for entire project for review and approval. Layout drawing to identify sequence of sections for:

1. Disinfection; not to exceed 4,000 linear feet per section.

2. Hydrostatic testing and transfer of services; to immediately follow sequence of disinfected section.

3. Site restoration; not to exceed limits specified; Sequence in order of disturbance.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Install watermain pipe materials, which conform to following:

1. Section 02501 - Ductile Iron Pipe and Fittings.

2. Section 02506 - Polyvinyl Chloride Pipe. (PVC)

B. Conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 and have certified by an organization accredited by ANSI.

C. Type of pipe materials used is Contractor's option unless specifically identified on Drawings.

D. Provide minimum of 3/8 inch inside joint recess between ends of pipe in straight pipe sections.

2.02 RESTRAINED PIPE JOINTS

A. Ductile-Iron Pipe (DI): Refer to Section 02501 - Ductile Iron Pipe and Fittings.

B. PVC Pipe: Refer to Section 02506 - Polyvinyl Chloride Pipe (PVC). Perform hydrostatic testing in accordance with ASTM F 1674.

C. Restrained Joints where required on DI and PVC pipe:

1. Restraint devices: Manufacture of high strength ductile iron, ASTM A 536 up to 24 inches, and ASTM A 36 for sizes greater than 30 inches. Working pressure rating twice that of design test pressure.

2. Bolts and connecting hardware: High strength low alloy material in accordance with ANSI A21.11/AWWA C111.

PART 3 EXECUTION

3.01 PREPARATION

A. Conform to applicable installation specifications for types of pipe used.

B. Employ workmen who are skilled and experienced in laying pipe of type and joint configuration being furnished. Provide watertight pipe and pipe joints.

C. Lay pipe to lines and grades shown on Drawings.

D. Confirm that eight (8) feet minimum separation from gravity sanitary sewers and manholes or separation of four (4) feet minimum from forcemains as specified in this Section in all directions unless special design is provided on Drawings.

E. Where above clearances cannot be attained, and special design has not been provided on Drawings, obtain direction from Contracting Officer before proceeding with construction.

F. Inform Contracting Officer if unmetered sprinkler or fire line connections exist which are not shown on Drawings. Make transfer only after approval by Contracting Officer

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G. Contractor shall coordinate with Ft. Sill DPW for operations involving opening and closing valves for wet connections and for chlorination. Contractor is responsible for handling necessary installations and removal of chlorination and testing taps and risers. Ft. Sill DPW shall coordinate with AW on-site field staff for operation involving water line/valve opening or closing.

H. If asbestos-cement (A.C.) pipe is encountered, follow safety practices outlined in American Water Works Association's (AWWA) publication, "Work Practices for A/C Pipe". Strictly adhere to "recommended practices" contained in this publication and make them "mandatory practices" for this Project.

I. Contractor is responsible for assuring chosen manufacturer fulfills requirements for extra fittings and, therefore, is responsible for costs due to downtime if requirements are not met.

J. Do not remove plugs or clamps during months of peak water demands; June, July and August, unless otherwise approved by Contracting Officer.

3.02 HANDLING, CLEANING AND INSPECTION

A. Handling:

1. Place pipe along project site where storm water or other water will not enter or pass through pipe.

2. Load, transport, unload, and otherwise handle pipe and fittings to prevent damage of any kind. Handle and transport pipe with equipment designed, constructed and arranged to prevent damage to pipe, lining and coating. Do not permit bare chains, hooks, metal bars, or narrow skids or cradles to come in contact with coatings. Where required, provide pipe fittings with sufficient interior strutting or cross bracing to prevent deflection under their own weight.

3. Hoist pipe from trench side into trench by means of sling of smooth steel cable, canvas, leather, nylon or similar material.

4. For large diameter watermain pipes, handle pipe only by means of sling of canvas, leather, nylon, or similar material. Sling shall be minimum 36 inches in width. Do not tear or wrinkle tape layers.

5. Use precautions to prevent injury to pipe, protective linings and coatings.

   a. Package stacked pipe on timbers. Place protective pads under banding straps at time of packaging.

   b. Pad fork trucks with carpet or other suitable material. Use nylon straps around pipe for lift when relocating pipe with crane or backhoe.

   c. Do not lift pipe using hooks at each end of pipe.

   d. Do not place debris, tools, clothing, or other materials on pipe.

6. Repair damage to pipe or protective lining and coating before final acceptance.

7. For cement mortar line permit no visible cracks longer than 6 inches, measured within 15 degrees of line parallel to pipe longitudinal axis of finished pipe

8. Reject pipe with visible cracks and remove from project site.

B. Cleaning: Thoroughly clean and dry interior of pipe and fittings of foreign matter before installation, and keep interior clean until Work has been accepted. Keep joint contact surfaces clean until jointing is completed. Do not place debris, tools, clothing or other materials in pipe. After pipe laying and joining operations are completed, clean inside of pipe and remove debris.

C. Inspection: Before installation, inspect each pipe and fitting for defects. Reject defective, damaged or unsound pipe and fittings and remove them from site.

3.03 EARTHWORK

A. Conform to applicable provisions of Section 02317 - Excavation and Backfilling for Utilities.

B. Bedding: Use bedding materials in conformance with Section 02320 - Utility Backfill Materials.

C. Backfill: Use bank run sand or earth or native soil as specified in Section 02320 - Utility Backfill Materials. Backfill excavated areas in the same day they were excavated for paved streets. When not possible, cover excavated areas using steel plates on paved areas and other protective measures elsewhere.

D. Place material in uniform layers of prescribed maximum loose thickness and wet or dry material to approximately optimum moisture content. Compact to prescribed density. Water tamping is not allowed.

E. Pipe Embedment: Including 6-inch pipe bedding and backfill to 12 inches above top of pipe.

3.04 PIPE CUTTING

A. Cut pipe 12 inches and smaller with standard wheel pipe cutters. Cut pipe larger than 12 inches in manner approved by Contracting Officer. Make cuts smooth and at right angles to axis of pipe. Bevel plain end with heavy file or grinder to remove sharp edges.

3.05 PIPING INSTALLATION

A. General Requirements:

1. Lay pipe in sub grade free of water.

2. Make adjustments of pipe to line and grade by scraping away sub grade or filling in with granular material.

3. Properly form bedding to fully support bell without wedging or blocking up bell.

4. Open Cut Construction: Keep pipe trenches free of water which might impair pipe laying operations. Grade pipe to provide uniform support along bottom of pipe.

   Excavate for bell holes after bottom has been graded and in advance of placing pipe. Lay not more than 300 feet of pipe in trench ahead of backfilling operations. Cover or backfill laid pipe if pipe laying operations are interrupted and during non-working hours. Place backfill carefully and simultaneously on each side of pipe to avoid lateral displacement of pipe and damage to joints. If adjustment of pipe is required after it has been laid, remove and re-lay as new pipe.

B. Install pipe continuously and uninterrupted along each street on which work is to be performed. Obtain approval of Contracting Officer prior to skipping any portion of Work.

C. Protection of Pipeline: Securely place stoppers or bulkheads in openings and in end of line when construction is stopped temporarily and at end of each day's work.

D. Perform Critical Location as shown on Drawings. Refer to Section 02317 - Excavation and Backfill for Utilities for additional requirements at critical locations.

E. For tie-ins to existing watermains, provide necessary material on hand to facilitate connection prior to shutting down existing watermain. Provide Contracting Officer a minimum of two weeks notice prior to shutting down existing watermain.

3.06 JOINTS AND JOINTING

A. Rubber Gasketed Bell-and-Spigot Joints for PVC, Steel, and DIP:

1. After rubber gasket is placed in spigot groove of pipe, equalize rubber gasket cross section by inserting tool or bar recommended by manufacturer under rubber gasket and moving it around periphery of pipe spigot.

2. Lubricate gaskets with nontoxic water-soluble lubricant before pipe units are joined.

3. Fit pipe units together in manner to avoid twisting or otherwise displacing or damaging rubber gasket.

4. After pipe sections are joined, check gaskets to ensure that no displacement of gasket has occurred. If displacement has occurred, remove pipe section and remake joint as for new pipe. Remove old gasket, inspect for damage

and replace if necessary before remaking joint.

5. Where preventing movement of 16-inch diameter or greater pipe is necessary due to thrust, use restrained joints as shown on Drawings.

   a. Include buoyancy conditions for soil unit weight when computing thrust restraint calculations.

   b. Do not include passive resistance of soil in thrust restraint calculations.

6. Except for PVC pipe, provide means to prevent full engagement of spigot into bell as shown on Drawings. Means may consist of wedges or other types of stops as approved by AW Project Manager.

B. Flanged Joints where required on Ductile Iron Pipe:

1. AWWA C 207. Prior to installation of bolts, accurately center and align flanged joints to prevent mechanical prestressing of flanges, pipe and equipment. Align bolt holes to straddle vertical, horizontal or north-south centerline. Do not exceed 3/64 inch per foot inclination of flange face from true alignment.

2. Use full-face gaskets for flanged joints. Provide 1/8-inch-thick cloth inserted rubber gasket material. Cut gaskets at factory to proper dimensions.

3. Use galvanized or black nuts and bolts to match flange material. Use cadmium-plated steel nuts and bolts underground. Tighten bolts progressively to prevent unbalanced stress. Maintain at all times approximately same distance between two flanges at points around flanges. Tighten bolts alternately (180° apart) until all are evenly tight. Draw bolts tight to ensure proper seating of gaskets. Provide Denso petroleum based tape or approved equal for all exposed portions of nuts, bolts and pipe.

4. Full length bolt isolating sleeves and washers shall be used with flanged connections. Furnish kits in accordance with AW's "Approved Products List." (We need this list to include in RFP package.)

5. PSI with nitrite seal gasket conforming to ANSI A 21.11 mechanical joint gaskets.

C. Restrained Joints

1. For existing watermains less than 16 inches in diameter, affected by new watermain construction, restrain existing pipe joints with concrete thrust blocks. For all new watermain construction, use thrust restraint glands for the pipe lengths either side of the mechanical joint fittings as shown on the Drawings and or as specified.

2. Thrust restraint lengths shown on Drawings are minimum anticipated lengths.

These lengths are based on deflections indicated and on use of pre-stressed concrete pressure pipe for large diameter lines and ductile iron pipe for small diameter lines. Adjustments in deflections or use of other pipe material may result in reduction or increase of thrust lengths. Perform calculations by pipe manufacturer to verify proposed thrust restraint lengths. Submit calculations for all pipe materials sealed by a registered Professional Engineer for the State in which the project is being constructed, for review by Contracting Officer. Make adjustments in thrust restraint lengths at no additional cost to Government.

3. Passive resistance of soil will not be permitted in calculation of thrust restraint.

4. For 16-inch lines and larger use minimum 16-foot length of pipe in and out of joints made up of beveled pipe where restraint joint lengths are not identified on Drawings. Otherwise, provide restraint joints for a minimum length of 16 feet on each side of beveled joints.

5. Installation.

   a. Install restrained joints mechanism in accordance with manufacturer's recommendations.

   b. Examine and clean mechanism; remove dirt, debris and other foreign material.

   c. Apply gasket and joint NSF 61 FDA food grade approved lubricant.

   d. Verify gasket is evenly seated.

   e. Do not over stab pipe into mechanism.

6. Prevent any lateral movement of thrust restraints throughout pressure testing and operation.

7. Place 2500 psi concrete conforming to Concrete for Utility Construction, for blocking at each change in direction of existing water lines, to brace pipe against undisturbed trench walls. Finish placement of concrete blocking, made from Type I cement, 4 days prior to hydrostatic testing of new watermain. Test may be made 2 days after completion of blocking if Type II cement is used.

D. Make curves and bends by deflecting joints or other method as recommended by manufacturer and approved by Contracting Officer. Submit details of other methods of providing curves and bends which exceed manufacturer's recommended deflection prior to installation.

1. Deflection of pipe joints shall not exceed maximum deflection recommended by pipe manufacturer, unless otherwise indicated on Drawings.

2. If deflection exceeds that specified but is less than 5 percent, repair entire

deflected pipe section such that maximum deflection allowed is not exceeded.

3. If deflection is equal to or exceeds 5% from that specified, remove entire portion of deflected pipe section and install new pipe.

4. Replace, repair, or reapply coatings and linings as required.

5. Assessment of deflection may be measured by Contracting Officer at any location along pipe. Arithmetical averages of deflection or similar average measurement methods will not be deemed as meeting intent of standard.

6. When rubber gasketed pipe is laid on curve, join pipe in straight alignment and then deflect to curved alignment.

3.07 SECURING, SUPPORTING AND ANCHORING

A. Support piping as shown on Drawings and as specified in this Section, to maintain line and grade and prevent transfer of stress to adjacent structures.

B. Where shown on Drawings, anchor pipe fittings and bends installed on water line by welding consecutive joints of pipe together to distance each side of fitting. Restrained length, as shown on Drawings, assumes that installation of pipe and Subsequent hydrostatic testing begins upstream and proceed downstream, with respect to normal flow of water in pipe. If installation and testing differs from this assumption, submit for approval revised method of restraining pipe joints upstream and downstream of device used to test against (block valve, blind flange or dished head plug).

C. Use adequate temporary blocking of fittings when making connections to distribution system and during hydrostatic tests. Use sufficient anchorage and blocking to resist stresses and forces encountered while tapping existing water line.

3.08 POLYETHYLENE WRAP FOR DUCTILE IRON PIPE

A. Double wrap pipe and appurtenances (except fire hydrants and fusion bond or polyurethane coated fittings) with 8-mil polyethylene film.

B. Conform to requirements of Section 02528 - Polyethylene Wrap.

3.09 CLEANUP AND RESTORATION

A. Provide cleanup and restoration crews to work closely behind pipe laying crews, and where necessary, during disinfection and hydrostatic testing, service transfers, abandonment of old watermains, backfill and surface restoration.

B. Unless otherwise approved by Contracting Officer, comply with the following;

1. Once water line is installed to limits approved in layout submitted, immediately begin preparatory work for disinfection effort.

2. No later than three days after completing disinfection preparatory work, submit to Contracting Officer appropriate request for disinfection.

3. If Contractor fails to perform initial disinfection of lines in accordance with Section 2514 - Disinfection of Water Lines, within seven days from submission of appropriate request, and if approved by Contracting Officer, pipe laying operations may continue beyond approved limits until the AWS responds.

4. Immediately after transfer of services, begin abandonment of old watermains and site restoration.

5. Do not exceed a total of 50% of total project linear feet of disturbed right-of-way and easement until site is restored in accordance with Site Restoration contract specifications. Allow access to adjacent construction sites. Coordinate with Contracting Officer and adjacent contractors.

6. Exceeding any of the above footage limitations shall be considered a material breach of the Contract and subject to termination in accordance with the General Conditions.

C. For large diameter watermains, do not install more than 2,000 linear feet of watermain, without the previous 2,000 linear feet being restored. Schedule paving crews so repaving work will not lag behind pipe laying work by more than 1,000 linear feet.

3.10 TRACING WIRE

A. Tracing wire is to be installed on all new watermain pipe for future locating purposes regardless of the watermain pipe material. A solid #12 gauge, TWU copper wire is to be installed along the top of the pipe, taped to the pipe at 20-foot intervals. All costs for the supply and installation of the tracing wire shall be included as part of the unit price bid for watermains.

B. The wire is to be installed between each valve and/or the end of the new watermain. Joints in the wire between valves are not permitted. At each valve (including fire hydrant isolation valves), a loop of wire is to be brought up the outside of the valve box and looped inside the box through a hole drilled 2 inches below the bottom of the lid as per tracer wire installation drawing.

C. The American Water Project Engineer may test the tracing wire for conductivity. If the tracing wire is not continuous the contractor shall, at his own expense, replace or repair the wire.

3.11 WATERMAIN WARNING TAPE

A. Watermain "Underground Warning Tape" is to be installed for all new watermain pipe installations for the purpose of protecting the watermain during future excavation in the vicinity regardless of the watermain pipe material. The Warning Tape as a minimum shall be 3 inches wide, 3.5-mil polyethylene, "blue" in color, with the wording "CAUTION – BURIED WATERLINE BELOW." All costs for the supply and installation of the underground watermain warning tape shall be included as part of the unit price bid for watermains.

B. The "Underground Warning Tape" is to be installed below the granular road base materials in order to provide a final depth of bury for the tape as being approximately 15 inches below the final road surface. Splice/over laps in the tape to be a minimum of 12 inches in length.

3.12 CLEANING PIPING SYSTEMS

A. Remove construction debris or foreign material and thoroughly swab clean and flush piping systems. Provide temporary connections, equipment and labor for cleaning. Contracting Officer must inspect watermain for cleanliness prior to filling.

3.13 DISINFECTION OF WATERMAINS

A. Conform to requirements of Section 02514 - Disinfection of Watermains.

3.14 FIELD HYDROSTATIC TESTS

A. Conform to requirements of Section 02515 - Hydrostatic Testing of Pipelines.

END OF SECTION

SECTION 02512

WATER TAP AND SERVICE LINE INSTALLATION

PART1 GENERAL

1.01 SECTION INCLUDES

A. Tapping existing and or new watermains and furnishing and installing new service lines for water.

B. Relocation of existing small water meters.

C. Specifications identify requirements for small-diameter (less than or equal to 20 inches) watermains.

1.02 REFERENCES

A. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.

B. AWWA C 900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution.

1.03 DEFINITIONS

A. Short Side Connection Service Line: Installation of a new corporation main stop and connecting a new length of proposed water service piping between the new proposed watermain to the existing water service piping connected to the existing watermain located on same side of street as to where the new watermain is being constructed.

B. Long Side Connection Service Line: Installation of a new corporation main stop, and connection to the existing water service piping that provides water service to the buildings on the opposite side (long side) of the street from of the centerline of the proposed new watermain..

PART 2 PRODUCTS

2.01 MATERIALS

A. Copper Tubing: In accordance with Section 02503 - Copper Tubing. Where existing service piping is determined to be ‘Copper’ new service piping shall be ‘Copper Tubing’ to match existing.

B. Corporation Main Stops: AWWA C 800 as modified in this Section:

1. Inlet End: AWWA standard thread.

2. Valve Body: Tapered plug type, O-ring seat ball type, or rubber seat ball type.

3. Outlet End: Flared-copper connection for use with Type K, soft copper or compression type fitting.

C. Provide taps for water line types and sizes in accordance with pipe tapping schedule located at end of this Section.

D. Dual Strap Saddles: Red brass body and straps; ductile-iron; vinyl-coated body and straps; or ductile-iron, vinyl-coated body and stainless-steel straps.

E. Taps for PVC Watermains: Use dual-strap or single, wide-band strap saddles which provide full support around circumference of pipe and bearing area of sufficient width along axis of pipe, 2 inches minimum, ensuring that pipe will not be distorted when saddle is tightened. Provide approved stainless-steel tapping saddle with AWWA standard thread.

F. Taps for Steel Pipe: Not allowed, unless specifically approved by Contracting Officer. Use saddle only when tap is approved on steel pipe.

G. Curb Stops and Brass Fittings: AWWA C 800 as modified in this Section.

1. Inlet End: Flared copper connection or compression-type fitting

2. Valve Body: Straight-through or angled, meter-stop design equipped with following:

   a. O-ring seal straight plug type.

   b. Rubber seat ball type.

3. Outlet End: Female, iron-pipe thread or swivel-nut, meter-spud thread on 3 ¼ -inch and finch stops and 2-hole flange on 1 ½ and 2-inch sizes.

4. Fittings: Provide approved fittings. Use same size open end wrenches and tapping machines as used with respective Mueller fittings.

5. Factory Testing of Brass Fittings:

   a. Submerge in water for 10 seconds at 85 psi with stop in both closed and open positions.

   b. Reject fitting that shows air leakage. Contracting Officer may confirm tests locally. Entire lot from which samples were taken will be rejected when random sampling discloses unsatisfactory fittings.

H. Angle Stops: In accordance with AWWA C 800; ground-key, stop type with bronze lockwing head stop cap; inlet and outlet threads conform to application tables of AWWA C 800; and inlets flared connection or compression.

1. Outlet for 3/4-inch and 1-inch size: Meter swivel nut with saddle support.

2. Outlet for 1 ½ -inch through 2-inch size: O-ring sealed meter flange, iron pipe threads.

I. Fittings: In accordance with AWWA C 800 and following:

1. Castings: Smooth, free from burrs, scales, blisters, sand holes, and defects which would make them unfit for intended use.

2. Nuts: Smooth cast and has symmetrical hexagonal wrench flats.

3. Flare-Joint Fittings: Smooth cast. Machine seating surfaces for metal-to-metal seal to proper taper or curve, free from pits or protrusions.

4. Thread fittings, of all types, shall have N.P.T. or AWWA threads, and protect male threaded ends in shipment by plastic coating, or approved equal.

5. Compression tube fittings shall have Buna-N beveled gasket.

6. Stamp of manufacturer's name or trademark and of fitting size on body.

PART 3 EXECUTION

3.01 GENERAL

A. For service lines and lateral connections larger than those allowed in Pipe Tapping Schedule, branch connections and multiple taps may be used. Space corporation stops minimum of 2 feet apart.

B. Tapped collars of appropriate sizes: Approved in new construction only provided they are set at right angles to proposed meter location.

C. Use tapping machine manufactured for pressure tapping purposes for 2-inch and smaller service taps on pressurized water lines.

D. For new meter or when existing meter is in conflict with proposed pavement improvements, locate water meters one foot inside street right-of-way, or when this is not feasible, one foot on curb side of sidewalk. Contact Contracting Officer when major landscaping or trees conflict with service line and meter box location. No additional payment will be made for work on customer side of meter.

E. New location and installation of existing small meter shall conform to requirements of this Section.

3.02 SERVICE INSTALLATION

A. Set service taps at right angles to proposed meter location and locate taps in upper pipe segment within 45 degrees of pipe springline.

B. Install service lines in open-cut trench in accordance with Section 02317 - Excavation and Backfill for Utilities. Install service lines under paved roadways, other paved areas and areas indicated on Drawings in bored hole in accordance with Paragraph 3.01 G.

C. Lay service lines with minimum of 30 inches of cover as measured from top of curb or, in absence of curbs, from centerline elevation of crowned streets or roads. Provide minimum of 18 inches of cover below flow line of ditches to service lines.

D. Service lines across existing street (push-unders): Pull service line through prepared hole under paving. Use only full lengths of tubing. Take care not to damage copper tubing when pulling it through hole. Compression-type union is only permitted when span underneath pavement cannot be accomplished with a full standard length of tubing. Use one compression-type union for each full length of tubing.

E. Maintain service lines free of dirt and foreign matter.

F. Install service lines so that top of meter will be 4 to 6 inches below finished grade.

G. Anticipate existing sanitary sewers to have cement stabilized sand backfill to bottom of pavement. Include cost of such crossings in unit price for services.

3.03 CURB STOP INSTALLATION

A. Set curb stops or angle stops at outer end of service line inside of meter box. Secure opening in curb stop to prevent unwanted material from entering. In close quarters, make S-curve in field. Do not flatten tube. In 3/4-inch and 1 - inch services, install meter coupling, swivel-nut, or curb stop ahead of meter. Install straight meter coupling on outlet end of meter.

3.04 SEQUENCE OF OPERATIONS

A. Open trench for proposed service line in accordance with Section 02317 - Excavation and Backfill for Utilities.

B. Install curb stop on meter end of service line.

C. With curb stop open and prior to connecting service line to meter in slack position, open corporation stop and flush service line thoroughly. Close curb stop, leaving corporation stop in full-open position.

D. Check service line for apparent leaks. Repair leaks before proceeding.

E. Schedule inspection with Contracting Officer prior to backfilling. After inspection, backfill in accordance with Section 02317 - Excavation and Backfill for Utilities.

F. Install meter box centered over meter with top of lid flush with finished grade. Meter box: Refer to Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

Table 02512

PIPE TAPPING SCHEDULE				
WATERMAIN TYPE AND DIAMETER	SERVICE SIZE			
	3/4"	1”	1-1/2”	2”
4” Cast Iron or Ductile Iron	DSS,WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
4” Asbestos Cement	WBSS	WBSS	DSS, WBSS	DSS, WBSS
4” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6” and 8” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12” Cast Iron or Ductile Iron	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12” Asbestos Cement	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12” PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16” and Up Cast Iron or Ductile Iron	DWBSS	DWBSS	DWBSS	DWBSS
16” and Up Asbestos Cement	DWBSS	DWBSS	DWBSS	DWBSS
16” and Up PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS - DUAL STRAP SADDLES
WBSS - WIDE BAND STRAP SADDLES
DWBSS - DUAL WIDE BAND STRAP SADDLES

END OF SECTION

SECTION 02513

WET CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet connections for new watermains and service lines to existing watermains.

1.02 REFERENCES

A. AWWA C 800 - Standard for Underground Service Line Valves and Fittings.

1.03 DEFINITIONS

A. Wet connections consist of isolating sections of pipe to be connected with existing valves, draining isolated sections, and completing connections.

B. Connection of 2-inch or smaller lines, which may be referred to on Drawings as "2-inch standard connections" or "gooseneck connections" will be measured as 2-inch wet connections. This item is not to be used as part of 2-inch service line.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe shall conform to requirements of applicable portions of Sections 02501 through 02528 related to piping materials and to water distribution.

B. Corporation cocks and saddles shall conform to requirements of Section 02512 - Water Tap and Service Line Installation.

C. Valves shall conform to requirements of Section 02521 - Gate Valves.

D. Brass fittings shall conform to requirements of AWWA C 800.

PART 3 EXECUTION

3.01 CONNECTION OPERATIONS

A. Plan wet connections in manner and at hours with least inconvenience public. Notify Contracting Officer at least 72 hours in advance of making connections.

B. Do not operate valves on water lines in use by American Water. American Water Utility Operations Division will handle, at no cost to Contractor operations involving opening and closing valves for wet connections.

C. Conduct connection operations when AW Inspector is at job site. Connection work shall progress without interruption until complete once existing water lines have been cut or plugs have been removed for making connections.

3.02 2-INCH WET CONNECTIONS

A. Tap water line. Use corporation cocks, saddles, copper tubing as required for line and grade adjustment, and brass fittings necessary to adapt to existing water line. Use 2-inch valves when indicated on Drawings for 2-inch copper gooseneck connections.

END OF SECTION

SECTION 02514

DISINFECTION OF WATERMAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disinfection of potable watermains.

1.02 REFERENCES

A. AWWA C 651 - Standard for Disinfecting Watermains.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.01 CONDUCTING DISINFECTION

A. Promptly disinfect watermains constructed before tests are conducted on watermains and before these watermains are connected to AW water distribution system.

B. Water for disinfection and flushing will be furnished by AW without charge.

C. Unless otherwise provided in Contract Documents, Contractor will conduct disinfection operations assisted by AW on-site field personnel.

D. Coordinate chlorination operations through Contracting Officer.

3.02 PREPARATION

A. Provide temporary blind flanges, cast-iron sleeves, plugs, necessary service taps, copper service leads, risers and jumpers of sizes, location and materials, and other items needed to facilitate disinfection of new watermains prior to connection to AW water distribution system. Normally, each valved section of watermain requires two each 3/4-inch taps. A 2-inch minimum blow-off is required for watermains up to and including 6-inch diameter.

B. Use fire hydrants as blow-offs to flush newly constructed watermains 8-inch diameters and above. Where fire hydrants are not available on watermains, install temporary blow-off valves and remove promptly upon successful completion of disinfection and testing.

C. Slowly fill each section of pipe with water in manner approved by Contracting Officer. Average water velocity when filling pipeline should be less than one

foot per second and shall not, under any circumstance, exceed 2 feet per second. Before beginning disinfection operations, expel air from pipeline.

D. Backfill excavations immediately after installation of risers or blow-offs.

E. Install blow-off valves at end of water line to facilitate flushing of dead-end water lines. Install permanent blow-off valves according to drawings.

F. If the main is 12 inches diameter or greater, the main should be pigged and then flushed at scouring velocity. See Section 02535 – Sanitary Sewer Force Mains Paragraph 3.04 for pigging procedure.

3.03 DISINFECTION BY CONTRACTOR

A. The following procedure will be used when disinfection by Contractor is required by Contract Documents:

1. Use not less than 100 parts of chlorine per million parts of water.

2. Chlorinating material to watermains in accordance with AWWA C 651.

3. After contact period of not less than 24 hours, flush system with clean water until residual chlorine is no greater than 1.0 parts per million parts of water.

4. Open and close valves in lines being sterilized several times during contact period.

5. If chemical compound is used for sterilizing agent, place in pipes as directed by Contracting Officer.

3.04 BACTERIOLOGICAL TESTING

A. After disinfection and flushing of water lines, bacteriological tests will be performed by an independent testing laboratory in accordance with Testing Laboratory Services. When test results indicate need for additional disinfection of water lines based upon State Department of Health requirements, Contractor shall assist AW with additional disinfection operations.

3.05 COMPLETION

A. Upon completion of disinfection and testing, remove risers except those approved for use in subsequent hydrostatic testing, and backfill excavation promptly.

END OF SECTION

SECTION 02515

HYDROSTATIC TESTING OF PIPELINES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field hydrostatic testing of newly installed watermain pipelines.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.01 PREPARATION

A. Disinfect newly constructed watermain pipelines prior to hydrostatic testing.

B. Hydrostatically test newly installed watermain pipelines after disinfection, when required, and before connecting to the water distribution system.

C. Water for testing will be charged to Contractor in accordance with local AW billing rates. Prior to hydrostatic testing, obtain a transient meter from the American Water Operations Staff. Deposit is required for transient meter.

D. Test pipelines in lengths between valves, or plugs, of not more than 4,000 feet.

E. Conduct hydrostatic tests in presence of Contracting Officer and AW Project Manager.

3.02 TEST PROCEDURES

A. Furnish, install, and operate connections, pump, meter and recording pressure gauges necessary for hydrostatic testing.

B. Allow watermain pipeline to sit minimum of 24 hours from time it is initially disinfected until testing begins, to allow pipe wall or lining material to absorb water.

C. For small diameter pipelines, expel air and apply minimum test pressure of 125 psi. For large diameter watermains, expel air and apply minimum test pressure of 150 psi.

D. Begin test by 9:00 a.m. unless otherwise approved by Contracting Officer. Maintain test pressure for 8 hours. When large quantity of water is required to

maintain pressure during test, discontinue testing until cause of water loss is identified and corrected.

E. Keep valves inside pressure reducing stations closed during hydrostatic pressure test.

F. Provide pipe sizes, lengths tested and amount of water required to bring the pressure in the pipe back to the initial pressure prior to the test with results of the leakage tests.

3.03 ALLOWABLE LEAKAGE FOR WATERLINES

A. Maximum allowable leakage for water lines with rubber gasketed joints: 3.19 gallons per inch nominal diameter per mile of pipe per 24 hours while testing.

C. For meter run installation, when work cannot be isolated and line fails pressure test, visual inspection of work by Contracting Officer and AW Project Manager for leakage during pressure test may be used to fulfill requirements of this section.

3.04 CORRECTION FOR FAILED TESTS

A. Repair joints showing visible leaks on surface regardless of total leakage shown on test. Check valves and fittings to ensure that no leakage occurs that could affect or invalidate test. Remove cracked or defective pipes, fittings, and valves discovered during pressure test and replace with new items.

B. Contracting Officer may require failed lines to be disinfected after repair and prior to retesting. Conduct subsequent disinfection operations in accordance with requirements of Section 02514 - Disinfection of Water Lines. Pay for water required for additional disinfection and retesting.

C. Repeat test until satisfactory results are obtained.

3.05 COMPLETION

A. Upon satisfactory completion of testing, remove risers remaining from disinfection and hydrostatic testing, and backfill excavation promptly.

END OF SECTION

SECTION 02516

CUT, PLUG AND ABANDONMENT OF WATERMAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cut, plug and abandonment of watermains.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit product data for proposed plugs and clamps for approval.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete for reaction blocks: Class B conforming to requirements of Section 03315 - Concrete for Utility Construction.

B. Plugs and clamps: Applicable for type of pipe to be plugged.

PART 3 EXECUTION

3.01 APPLICATION

A. Do not begin cut, plug and abandonment operations until replacement watermain has been constructed, disinfected, and tested, and service lines have been transferred to replacement watermain.

B. Install plug, clamp, and concrete reaction block and make cut at location shown on drawings.

C. Main to be abandoned shall not be valved off and shall not be cut or plugged other than at supply watermain or as shown on Drawings.

D. After watermain to be abandoned has been cut and plugged, check for other sources feeding abandoned watermain. When sources are found, notify Contracting Officer immediately. Cut and plug abandoned watermain at point of other feed as directed by Contracting Officer.

E. Plug or cap ends or openings in abandoned watermain in manner approved by Contracting Officer.

F. Remove and dispose of surface identifications such as valve boxes and fire hydrants. Valve boxes in improved streets, other than shell, may be filled with concrete after removing cap.

G. Backfill excavations in accordance with Section 02317 - Excavation and Backfill for Utilities.

H. Repair street surfaces in accordance with Section 02951- Pavement Repair and Resurfacing.

END OF SECTION

SECTION 02520

FIRE HYDRANTS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Fire hydrants.

B. Adjustment of fire hydrants and gate valves.

.02 REFERENCES

A. AWWA C 502 - Standard for Dry Barrel Fire Hydrants (Latest Edition).

B. AWWA C 550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants

C. SSPC SP2 - Hand Tool Cleaning

D. SSPC SP3 - Power Tool Cleaning

E. SSPC SP10 - Near-White Blast Cleaning

F. SSPC SP11 - Power Tool Cleaning to Bare Metal

G. SSPC Paint Spec No.21

H. SSPC-Paint 21 - White or Colored Silicone Alkyd Paint

I. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

J. SSPC-Paint 104 - White or Tinted Alkyd Paint

K. Federal Standard A-A-2962A - Enamel, Alkyd, Solvent Based Low VOC

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit name of hydrant manufacturer, type of bonnet paint, and engineering control drawing number for hydrant proposed for use.

PART 2 PRODUCTS

.01 HYDRANTS

A. Provide hydrants in conformance with AWWA C 502, Standard for Dry Barrel Fire Hydrants (Latest Edition). Hydrants are approved by AW by issuance of a Certificate of Responsibility. The following hydrants are approved with no

substitutions.

HYDRANT	ENGINEERING CONTROL DRAWING – AMERICAN WATER
Clow – 5 ¼" Medallion	D-20454 Rev. J dated 02/97 D-20455 Rev. B dated 06/20/00 and 94-20051 dated 10/26/94

B. The Contracting Officer may, at any time prior to or during installation of hydrants, randomly select furnished hydrant for disassembly and laboratory inspection, at AW's expense, to verify compliance with Specifications. When a hydrant is found to be non-compliant, replace hydrant at Contractor's expense with a hydrant that complies with the Specifications.

C. Provide lower hydrant barrel fabricated from Ductile Iron Pipe as single piece, connected to upper hydrant barrel by means of joint coupling that will provide three hundred sixty (360) degree rotation of upper barrel.

.02 LEADS

A. Branches (Leads): Conform to requirements of Section 02501 - Ductile Iron Pipe and Fittings, Section 02506 - Polyvinyl Chloride Pipe.

.03 HYDRANT PAINTING

A. New hydrants and refurbished hydrants shall be shop coated as specified herein.

B. Exterior Above Traffic Flange (Including Bolts & Nuts).

1. Surface preparation to be in accordance with SSPC-SP 10 (NACE 2) near white blast cleaned surface.

2. Coat with three coat alkyd/silicone alkyd system with total dry film thickness (DFT) of 6 - 9 mils as follows:

a. Prime Coat - Oil modified alkyd primer, to be in general conformance with SSPC Paint Specification No. 25. Total dry film thickness (DFT) 2 - 3 mils.

b. Intermediate Coat - Heavy Duty Industrial Alkyd Enamel to be in general conformance with SSPC Paint Specification No. 104, and Federal Standard A-A-2962A. Total dry film thickness (DFT) of 2 -3 mils.

c. Finish Coat - Silicone Alkyd Resin Enamel to be in general conformance with SSPC Paint Specification No. 21. Total dry film thickness (DFT) to be 2 - 3 mils. Exception - hydrant bonnet shall not be finished shop coated, only intermediate coated. Install color coded finish coating of bonnet in field.

d. Bonnet Paint - Field apply finish coat of Silicone Alkyd Resin Enamel to be in general conformance with SSPC Paint Specification No. 21. Dry film thickness of 2 - 3 mils. Bonnet colors are to be as specified in Paragraph 3.01 to designate the appropriate size of water supply line.

3. Colors - Primer: Manufacturers standard color. Finish coat of hydrant body: ACRO 555 Crystal Blue or equivalent. Connection caps: Finished coated white. Paint white band of finish coat two inches in width on hydrant body approximately six inches above and parallel to traffic flange. Intermediate coat: Contrasting color to blue finish, such as white.

C. Field Maintenance Painting (Exterior Above Traffic Flange)

1. Surface Preparation to be in accordance with SSPC - SP2, Hand Tool Cleaning, or SSPC - SP3, Power Tool Cleaning, depending on condition of existing paint and extent of corrosion. It is not necessary to remove tightly adhered mill scale, rust, and paint. Mill scale, rust and paint are considered tightly adherent when they cannot be removed with dull putty knife. In some severe cases where it is necessary to remove majority of existing paint, surface should be cleaned in accordance with SSPC -SP11, Power Tool Cleaning to Bare Metal.

2. When surface is cleaned to bare metal (SSPC - SP11), coat hydrant with three coat Alkyd/Silicone Alkyd system in accordance with Paragraph 2.03.B.2 as for new hydrants. When surface is cleaned to SSPC - SP2 or SSPC - SP3, coat hydrant with Silicone Alkyd Resin Enamel in general conformance with SSPC Paint Specification No. 21. Total dry film thickness of 3 - 6 mils surface is cleaned to bare metal (SSPC - SP11), coat hydrant with three coat Alkyd/Silicone Alkyd system in accordance with Paragraph 2.03.B.2 as for new hydrants.

D. Exterior Below Traffic Flange

1. Surface preparation in accordance with SSPC- SP10 (MACE 2) Near White Blast Cleaned Surface.

2. Primer and intermediate coat: coal tar epoxy in general conformance with SSPC Paint Specification No. 16. Apply two (2) coats with dry film thickness (DFT) of 8 - 10 mils each for total DFT of 16 -20 mils.

3. Finish coat: Water based vinyl acrylic mastic Apply one coat with dry film thickness of 6 - 8 mils. Color of finish coat to be same as finish coat for exterior above traffic flange, i.e., blue. (Acro 555 Crystal Blue, or equivalent.)

E. Interior Surfaces Above and Below Water Line Valve

1. Material used for internal coating of hydrant interior ferrous surfaces below water line valve must meet the requirements of local state standards.

2. Coating shall be liquid or powder epoxy system in accordance with AWWA Standard C - 550 (latest revision). Coating may be applied in two or three coats, according to manufacturer's recommendations, for total dry film thickness of 12 -18 mils.

PART 3 EXECUTION

.01 INSTALLATION

A. Set fire hydrant plumb and brace at locations and grades as shown on Drawings. When barrel of hydrant passes through concrete slab, place 1-inch-thick piece of standard sidewalk expansion joint material around section of barrel passing through concrete.

B. Locate nozzle center line minimum 18 inches above finish grade.

C. Place 12-inch by 12-inch yellow indicators (plastic, sheet metal, plywood, or other material approved by Project Manager) on pumper nozzles of new or relocated fire hydrants installed on new water lines not in service. Remove indicators after new water line is tested and approved by Contracting Officer.

D. Do not cover drain ports when placing concrete thrust block.

E. Obtain Contracting Officer's approval in writing prior to installation of hydrants which require changes in bury depth due to obstructions not shown on Drawings. Cost adjustments will not be allowed for changes in water line flow line or fire hydrant barrel length caused by obstructions.

F. Plug branch lines to valves and fire hydrants shown on Drawings to be removed. Deliver fire hydrants designated for salvage to nearest American Water Utility Maintenance Quadrant Facility.

G. Install branches (leads) in accordance with Section 02511 – Water Mains.

H. Coating Requirements:

1. Apply coatings in strict accordance with manufacturer's recommendations. No requirements of this specification shall cancel or supersede written directions and recommendations of specific manufacturer so as to jeopardize integrity of applied system.

2. Furnish affidavit of compliance that coatings furnished complies with requirements of this specification and referenced standards, as applicable.

I. Use following color code for field coating of hydrant bonnet to indicate size of water line supplying hydrant:

Supply Water Line Diameter (inches)	Bonnet Color
6	Yellow
8	White
12-20	Green
24 and larger	Orange

J. Remove and dispose of unsuitable materials and debris in accordance with requirements of Waste Material Disposal.

END OF SECTION

SECTION 02521

GATE VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gate valves.

1.02 REFERENCES

A. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

B. ASTM B 62 - Standard Specification for Composition Bronze or Ounce Metal Casting.

C. ASTM D 429 - Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.

D. ASTM B 763 - Standard Specification for Copper Alloy Sand Casting for Valve Application.

E. AWWA C 500 - Standard for Metal-Seated Gate Valves for Water Supply Service.

F. AWWA C 509 - Standard for Resilient-Seated Gate Valves for Water Supply Service.

G. AWWA C 515- Standard for Reduced Wall, Resilient- Seated Gate Valves for Water Supply Service.

H. AWWA C 550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturer's product data for proposed valves for approval.

D. Provide detailed drawings of gearing mechanism for 20-inch and larger gate valves.

1.04 QUALITY CONTROL

A. Submit manufacturer's affidavit that gate valves are manufactured in the United States and conform to stated requirements of AWWA C 500, AWWA C 509, AWWA C 515, and this Section, and that they have been satisfactorily tested in the United States in accordance with AWWA C 500, AWWA C 509, and AWWA C 515.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gate Valves: AWWA C 500, AWWA C 509, AWWA C 515 and additional requirements of this Section. Direct bury valves and those in subsurface vaults open clockwise; aboveground and plant valves open counterclockwise.

B. If type of valve is not indicated on Drawings, use gate valves as line valves for sizes 16 inches and smaller. When type of valve is indicated, no substitute is allowed.

C. Gate Valves 1-1/2 inches in Diameter and Smaller: 125 psig; bronze; rising-stem; single-wedge; disc type; screwed ends

D. Coatings for Gate Valves 2 inches and larger: AWWA C 550 non-toxic, imparts no taste to water, functions as physical, chemical, and electrical barrier between base metal and surroundings, minimum 8-mil-thick, fusion-bonded epoxy. Prior to assembly of valve, apply protective coating to interior and exterior surfaces of body.

E. Gate Valves 2 inches in diameter: Iron body, double disc or resilient-seated, non-rising stem, 150-pound test, 2-inch square nut operating clockwise to open.

F. Gate Valves 3 inches to 12 inches in diameter: Non-directional, standard-wall resilient seated (AWWA C 509), parallel seat double disc (AWWA C 500), or reduced-wall resilient seated gate valves (AWWA C 515), 200 psig pressure rating, bronze mounting, push-on bell ends with rubber joint rings, and nut-operated unless otherwise specified. Provide approved standard-wall resilient seated valves. Provide approved reduced-wall resilient seated valves. Provide approved double disc valves. Comply with following requirements unless otherwise specified in Drawings:

1. Design: Fully encapsulated rubber wedge or rubber seat ring mechanically attached with minimum 304 stainless-steel fasteners or screws; threaded connection isolated from water by compressed rubber around opening.

2. Body: Cast or ductile iron, flange bonnet and stuffing box together with ASTM A 307 Grade B bolts. Manufacturer's initials, pressure rating, and year manufactured shall be cast in body.

3. Bronze: Valve components in waterway to contain not more than 15 percent zinc and not more than 2 percent aluminum.

4. Stems: ASTM B 763 bronze, alloy number-995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12 percent, non-rising.

5. O-rings: For AWWA C 500, Section 3.12.2. For AWWA C 509, Sections 2.2.6 and 4.8.2. For AWWA C 515, Section 4.2.2.5.

6. Stem Seals Consist of three O-rings, two above and one below thrust collar with antifriction washer located above thrust collar for operating torque.

7. Stem Nut: Independent or integrally cast of ASTM B 62 bronze.

8. Resilient Wedge: Molded, synthetic rubber, vulcanized and bonded to cast or ductile iron wedge or attached with 304 stainless steel screws tested to meet or exceed ASTM D 429 Method B; seat against epoxy-coated surface in valve body.

9. Bolts: AWWA C 500 Section 3.4, AWWA C 509 Section 4.4 or AWWA C 515 Section 4.4.4; stainless steel; cadmium plated, or zinc coated.

G. Gate valves 14 inch and larger in Diameter: AWWA C 500; parallel seat double disc gate valves; push-on bell ends with rubber rings and nut-operated unless otherwise specified. Provide approved double disc valves with 150 psig pressure rating. Comply with following requirements unless otherwise specified on Drawings:

1. Body: Cast iron or ductile iron; flange together bonnet and stuffing box with ASTM A 307 Grade B bolts. Cast following into valve body manufacturer's initials, pressure rating, and year manufactured. When horizontally mounted, equip valves greater in diameter than 12 inches with rollers, tracks, and scrapers.

2. O rings: For AWWA C 500, Section 3.12.2. For AWWA C 515, Section 4.2.2.5.

3. Stems: ASTM B 763 bronze, alloy number-995 minimum yield strength of 40,000 psi; minimum elongation in 2-inches of 12 percent, non-rising.

4. Stem Nut: Machined from ASTM B 62 bronze rod with integral forged thrust collar machined to size; non-rising.

5. Stem Seals: Consist of three O-rings, two above and one below thrust collar with antifriction washer located above thrust collar for operating torque.

6. Bolts: AWWA C 500 Section 3.4 or AWWA C 515 Section 4.4.4; stainless steel; cadmium plated, or zinc coated.

7. Discs: Cast iron with bronze disc rings securely penned into machined dovetailed grooves.

8. Wedging Device: Solid bronze or cast-iron, bronze-mounted wedges. Thin plates or shapes integrally cast into cast-iron surfaces are acceptable. Other moving surfaces integral to wedging action shall be bronze monel or nickel alloy-to-iron.

9. Provide bypass for valves 24 inches and larger.

10. Bronze Mounting: Built as integral unit mounted over, or supported on, cast-iron base and of sufficient dimensions to be structurally sound and adequate for imposed forces.

11. Gear Cases: Cast iron; furnished on 18-inch and larger valves and of extended type with steel side plates, lubricated, gear case enclosed with oil seal or O-rings at shaft openings.

12. Stuffing Boxes: Located on top of bonnet and outside gear case.

H. Gate valves 14 inches to 24 inches: Provide AWWA C 515; reduced-wall, resilient seated gate valves with 250 psig pressure rating. Furnish with spur or bevel gearing.

1. Mount valves horizontally if proper ground clearance cannot be achieved by normal vertical installation. For horizontally mounted gate valves, provide bevel operation gear mounted vertically for above ground operation.

2. Use valve body, bonnet, wedge, and operator nut constructed of ductile iron. Fully encapsulate exterior of ductile iron wedge with rubber.

3. Ensure wedge is symmetrical and seals equally well with flow in either direction.

4. Provide ductile iron operator nut with four flats at stem connection to apply even input torque to the stem.

5. Bolts: AWWA C515, Section 4.4.4, Stainless Steel; cadmium plated or zinc coated.

6. Provide high strength bronze stem and nut.

7. O-rings: AWWA C515, Section 4.2.2.5, pressure O-rings as gaskets.

8. Provide stem sealed by three O-rings. Top two O-rings are to be replaceable with valve fully open at full rated working pressure.

9. Provide thrust washers to the thrust collar for easy valve operation.

K. Gate Valves Extension Stem: When shown on Drawings, provide non-rising, extension stem having coupling sufficient to attach securely to operating nut of valve. Upper end of extension stem shall terminate in square wrench nut no deeper than 4 feet from finished grade or as shown on Drawings. Support extension stem with an arm attached to wall of manhole or structure that loosely holds extension stem and allows rotation in the axial direction only.

L. Gate Valves in Factory Mutual (Fire Service) Type Meter Installations: Conform to provisions of this specification; outside screw and yoke valves; carry label of Underwriters' Laboratories, Inc.; flanged, Class 125; clockwise to close.

PART 3 EXECUTION

3.01 INSTALLATION

A. Earthwork. Conform to applicable provisions of Section 02317 - Excavation and Backfilling for Utilities.

B. Operation. Do not use valves for throttling without prior approval of manufacturer.

3.02 SETTING VALVES AND VALVE BOXES

A. Remove foreign matter from within valves prior to installation. Inspect valves in open and closed positions to verify that parts are in satisfactory working condition.

B. Install valves and valve boxes where shown on Drawings. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of 4 feet, or to undisturbed trench face when less than 4 feet. Install valves completely closed when placed in water line.

C. For pipe section of each riser, use only 6 inch, ductile iron Class 51, or DR18 PVC pipe cut to proper length. Riser must be installed to allow complete access for operation of valve. Assemble and brace box in vertical position as indicated on Drawings.

3.03 DISINFECTION AND TESTING

A. Contractor shall disinfect valves and appurtenances as required by Section 02514 - Disinfection of Water Lines and test as required by Section 02515 - Hydrostatic Testing of Pipelines, with Contracting Officer in attendance.

B. Double-Disc Gate Valves: Apply hydrostatic test pressure equal to twice rated working pressure of valve between discs. Valve shall show no leakage through metal, flanged joints, or stem seals. Test at rated working pressure, applied between discs. Valve shall show no leakage through metal, flanged joints, or stem seals. Do not exceed leakage rate of 1 oz/hr/inch of nominal valve size.

C. Solid-Wedge Gate Valves: Apply hydrostatic pressure equal to twice rated working pressure of valve with both ends bulkheaded and gate open. Valve shall show no leakage through metal, flanged joints, or stem seals. Test at rated working pressure, applied through bulkheads alternately to each side of closed gate with opposite side open for inspection. Valve shall show no leakage through metal, flanged joints, or stem-seals. Do not exceed leakage rate of 1 oz/hr/inch of nominal valve size.

D. Repair or replace valves which exceed leakage rate.

3.04 PAINTING OF VALVES

A. Paint valves in vaults, stations, and above ground with approved paint.

END OF SECTION

SECTION 02522

BUTTERFLY VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Butterfly valves.

1.02 REFERENCES

A. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM A 126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

C. AWWA C 504 - Standard for Rubber-Seated Butterfly Valves.

D. AWWA C 550 - Standard for Protective Interior Coatings for Valves and Hydrants.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturer's product data for proposed valves and actuators for approval.

C. Submit manufacturer's affidavit for proposed valves and actuators certifying compliance with specifications.

D. Submit manufacturer's affidavit that butterfly valves were manufactured in the United States, and conform to applicable requirements of AWWA C 504 and that they have been satisfactorily tested in the United States in accordance with AWWA C 504 using test pressure of 150 psi in both directions. Submit Proof-of-Design and hydrostatic testing procedure in accordance with AWWA C 504.

E. Submit manufacturer's affidavit that coating for interior surfaces of valves conform to applicable requirements of AWWA C 550. Submit results of holiday test and thickness measurements of coatings.

F. Furnish, at time of delivery, affidavit of compliance, as specified in Section 6.3 of AWWA C 504 certifying compliance with applicable portion of AWWA C 504 and modification or supplements herein. Furnish certified drawings and material test records by manufacturer covering items included in Section 4.3 of AWWA C 504, for review. Furnish certified copies of test reports covering

items in Sections 4.5.8.5.5, 4.5.8.5.8 and 5.2.1 through 5.2.4.3 of AWWA C 504 for review.

G. Submit data indicating maximum torque required to open valve, maximum torsional strength of shaft and torque output of actuator.

H. Provide submittal information on CD-ROM in Adobe portable document format (*.PDF).

I. Include number of turns to operate valves to fully open/closed.

1.04 QUALITY CONTROL

A. Perform valve leakage tests in both directions at 150 psi in factory and field. Hydrostatic field tests of 150 psi shall be made against dished head plug or similar arrangement.

B. For purposes of interpreting referenced AWWA tests, the following shall apply: Shutoff pressure is 150 psi; cycle consists of rotating disc from fully opened to fully closed position, for valves larger than 72 inches, proof of design shall require 1000 cycles and shall be performed on valve greater than 72 inches of like design and construction. When proof of design tests are performed on valve delivered to job site, replace disc, bushing, shaft and seals with new and unused items, and test and certify as described above.

C. Hydrostatic Testing by Manufacturer:

1. Hydrostatic testing to be witnessed by Contracting Officer prior to shipment of valves. Provide minimum 4 weeks notice to Contracting Officer to schedule witness testing. When possible, maximize number of valves to be tested during a plant visit, no more than two visits will be allowed per project to witness test valves, unless otherwise approved by Contracting Officer. Contracting Officer will pay expenses for each visit up to total of two visits incurred by Contracting Officer to witness testing of each grouping of valve(s) per project. Expenses for subsequent or extended visits by Contracting Officer for defective valves, improper scheduling or valve failures are to be paid by Contractor. Witness of hydrostatic testing by Contracting Officer will only be in regards to compliance with this specification and will not constitute approval by Contracting Officer nor relieve Contractor of obligations to comply with contract documents.

2. Document serial number on valve at time of testing and reflect in certified test records furnished to Contracting Officer. Identification plate must be permanently affixed to valve and actuator prior to hydrostatic testing.

3. Hydrostatic testing to conform to AWWA C504 except as modified below:

a. Install actuator prior to hydrostatic testing. Test actuator to verify actual number of turns match manufacturer's published number of turns.

Verify valve stops are in correct positions.

b. Fully open and close valve prior to performing shell test and prior to each leakage test.

c. Perform shell test first.

d. When tested with water, adequately dry seat and disc.

e. When tested with air, fill top of valve with water to aid in viewing possible leakage.

f. Pressure Gauges: Calibrated within past 12 months; 0-500 psi range in increments of 5 psi, present calibration certificates prior to hydrostatic testing.

g. If seat adjustment is required during hydrostatic testing, perform valve leakage test again in both directions. Once seat adjustment is made, fully open and fully close valve three (3) times, and repeat leakage test.

4. Field Testing

a. When valve arrives at the job site, Contractor is to operate valve fully open and closed twice in presence of Contracting Officer. Document number of turns to open and close each time.

b. Install operator nut plum.

c. After valve is installed, repeat the operation test and document number of turns in presence of Contracting Officer.

d. Manufacturer's representative must be present to witness the operation test again at the substantial walk thru. Verify valve operates fully open/closed twice at the appropriate number of turns.

PART 2 PRODUCTS

2.01 VALVES AND ACTUATORS

A. Butterfly Valves and Actuators: Provide approved butterfly valves and actuators. Conform to AWWA C 504, except as modified or supplemented herein.

B. If type of valve is not indicated on Drawings, use butterfly valves for line valve sizes 24-inch and larger. When type of valve is specified on Drawings, no substitute will be allowed, unless otherwise approved by Contracting Officer.

C. Butterfly valves shall be short-body, flanged design and installed at locations as shown on Drawings.

D. Direct-bury valves and valves in subsurface vaults shall open clockwise. Above-ground and plant valves shall open counterclockwise.

2.02 VALVE CONSTRUCTION

A. Valves: AWWA C 504, Class 150B. Body: Cast iron, ASTM A 126, Class B. Flanges: ASME B 16.1, Class 125 lb.

B. Discs for Butterfly Valves: Either cast iron or ductile iron. Valves greater than 54 in diameter must utilize flow through disc.

C. Seats: Buna-N or neoprene, and may be applied to disc or body. Seats shall be mechanically secured and may not rely solely on adhesive properties of epoxy or similar bonding agent to attach seat to body. Seats on disc shall be mechanically retained by stainless steel (18-8) retaining ring held in place by stainless steel (18-8) cap screws that pass through rubber seat for added retention. When seat is on disc, seat shall be retained in position by shoulders located on both disc and stainless-steel retaining ring. Mating surfaces for seats: Type 304 or 316, stainless steel and secured to disc by mechanical means. Sprayed-on or plated mating surfaces will not be allowed. Seat must be replaceable in field for valves greater than 30 inches in diameter. Valves with segmented retaining rings will not be accepted.

D. Coat interior wetted ferrous surfaces of valve, including disc, with epoxy suitable for potable water conditions. Epoxy, surface preparation, and epoxy application: In accordance with AWWA C 550 and coating manufacturer's recommendations. Provide three coats of two-component, high-build epoxy with minimum dry film thickness of 12 mils. Provide approved epoxy coating. Coatings shall be holiday tested and measured for thickness.

E. Valve shaft and keys: 24 inches in diameter and greater valves require a minimum of two (2) taper pins used for attaching valve shaft to valve disc, use of torque plug for purposes of attaching valve shaft to valve disc is not permitted: Type 316 stainless steel. Shaft Bearings: Stainless steel, bronze, nylon, or Teflon (supported by fiberglass mat or backing material with proven record of preventing Teflon flow under load) in accordance with AWWA C 504. Sinter stainless steel bearing material. Design valve shaft to withstand 3 times amount of torque necessary to open valve.

F. Packing: Self adjusting and wear compensating, full or split ring V-type, and replaceable without removing actuator assembly.

G. Retaining Hardware for Seats: Type 304 or 316 stainless steel. Nuts and screws used with clamps and discs for rubber seats shall be held securely with lock tight, or other approved method, to prevent loosening by vibration or cavitational effects.

H. Valve disc shall seat in position at 90 degrees to pipe axis and shall rotate 90 degrees between full-open and tight-closed position. Install valves with valve shafts horizontal and convex side of disc facing anticipated direction of flow, except where shown otherwise on Drawings.

I. For valves utilizing retaining rings, tighten bolts to a uniform torque. Measure torque prior to testing valve.

2.03 VALVE ACTUATOR CONSTRUCTION

A. Provide actuators for valves with size based on line velocity of 12 feet per second and uni-directional service, and, unless otherwise shown on Drawings, equip with geared manual actuators. Provide fully enclosed and traveling-nut type, rack-and-pinion type, or wormgear type for valves 20 inches and smaller. Provide worm-gear type for valves 24 inches and larger.

B. Provide actuator designed for installation with valve shaft horizontal unless otherwise indicated on Drawings.

C. Provide bonnet extensions, as required, between valve body and actuator. Space between actuator housing and valve body shall be completely enclosed so that no moving parts are exposed to soil or elements.

D. Provide oil-tight and watertight actuator housings for valves, specifically designed for buried service or submerged service when located in valve vaults, and factory packed with suitable grease.

E. Install valve position indicator on each actuator housing located above ground or in valve vaults. Valves shall be equipped with 2-inch actuator nut only.

F. Indicate direction of opening of valve on exposed visible part of assembly and cast direction of open on 2 inch nut on top of valve operator extension. Paint 2 inch actuator nut and extension shaft black when counter clockwise open and red when clockwise to open.

G. Design worm-gear or traveling-nut actuators to be self-locking and designed to transmit twice the required actuator torque without damage to faces of gear teeth or contact faces of screw or nut.

2.04 VALVE BOXES

A. Provide Standard Type "A" valve boxes conforming to requirements of Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

2.05 VALVE SERVICE CHAMBERS

A. For large diameter watermains (20-inch or larger), provide chambers to dimensions shown on Drawings conforming to requirements of Section 02082 - Precast Concrete Manholes.

PART 3 EXECUTION

3.01 EARTHWORK

A. Conform to applicable provisions of Section 02317 - Excavation and Backfill for Utilities.

3.02 SETTING VALVES AND VALVE BOXES

A. Prior to Hydrostatic testing of watermain and valve:

1. Test valve by opening and closing valve at a minimum of two times to verify valve seats properly.

2. Verify number of turns from fully open to fully closed position is same as identified in manufacturer's submittal.

3. Adjust valve as required if number of turns do not match.

4. Remove foreign matter from within valves.

B. Install valves where shown on Drawings or as located by Contracting Officer. Use valve boxes for 16 inch and 24 inch valves. Set valves plumb and as detailed. Center valve boxes on valves. Carefully tamp earth around each valve box for minimum radius of 4 feet, or to undisturbed trench face when less than 4 feet.

C. Avoid disturbing or overstressing valve body when installing valves. Perform field adjustment of valves under pressure to ensure shutoff occurs in number of rotations as described in valves operation and maintenance manual.

D. Attach two four (4) foot lengths of pipe to each side of valve prior to installation in line.

E. Submit certification that large diameter valve was installed, adjusted, and exercised in accordance with manufacturer's instructions. Manufacturer's certification shall state that all performance characteristics of large diameter valves, as installed, have been met. Adjustments made to valve, for any reason, must be made by manufacturer's representative.

3.03 DISINFECTION AND TESTING

A. Contractor shall perform disinfection of valves and appurtenances as required by Section 02514 - Disinfection of Watermains and test as required by Section 02515 - Hydrostatic Testing of Pipelines in attendance of Contracting Officer. Do not use valves for throttling without prior approval of manufacturer.

3.04 COATING OF PIPING

A. Coat valves located in vaults, stations, and above ground using approved paint. Minimum of two (2) coats shall be applied with minimum of three (3) mil thickness. Apply coating in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 02523

PRESSURE REDUCING VALVES

PART 1 GENERAL

.01 SECTION INCLUDES

A. Pressure reducing valves (PRV).

.02 REFERENCES

A. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

B. ASTM A 48 - Standard Specification for Gray Iron Castings.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturer's product data for proposed valves for approval.

C. Submit design calculations and shop drawings for valve vaults and manholes, sealed by Engineer registered in the State that the project is in.

.04 QUALITY CONTROL

A. Submit manufacturer's affidavit that pressure reducing valves purchased for Work, were manufactured and tested in the United States, and conform to requirements of this Section.

PART 2 PRODUCTS

.01 MATERIALS

A. Provide approved PRV with basket strainer in location and arrangement as shown on Drawings.

1. Valve body: Ductile iron with ASME B16.1, Class 125, flanges.
2. Valve cover: ASTM A 48 cast iron.
3. Valve internals:
   a. Provide top and bottom single moving disc and diaphragm assembly.
   b. Use flexible nylon fabric reinforced elastomer diaphragm integral with assembly.
   c. Provide valve internal trim (seat ring, disc guide, and cover bearing)

made of stainless steel.

d. Provide heat fusion bonded epoxy coating to internal and external surfaces of valve body including disc retainer and diaphragm washer. Holiday test coating applied to valve body.

e. Treat stem and seat with penetrative salt nitride process.

f. Use Xylan coated seat.

g. Do not use leather parts.

B. Control Tubing: Contain shutoff cocks with Y-strainer.

C. PRV: Equip with visual valve position indicator. Fit valve position indicator with air-bleed petcock. Initially set in field by authorized manufacturer's representative with 60 psi downstream pressure.

D. Provide basket strainer upstream of PRV as shown on Drawings.

1. Strainer body: Quick-opening type, fabricated-steel construction with ANSI B 16.1, Class 150, flanges.

2. Basket: Type 304, stainless steel.

3. Model: Provide basket compatible with the manufacturer of the pressure reducing valve. Hayward Model 90, or approved equal, for PRV 4 inches through 24 inches. Provide Hayward Model 510, or approved equal, for PRV 14 inches or greater when space limitations dictate use of smaller strainer housing.

E. Provide pressure reducing pilot that has adjustable range of 20 - 175 psi. Provide and install pilot system components according to manufacturer's recommendations unless otherwise approved by Contracting Officer.

F. Valve Vaults: Provide as shown on Drawings and conforming to requirements of Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

PART 3 EXECUTION

.01 EARTHWORK

A. Conform to applicable provisions of Section 02317 - Excavation and Backfill for Utilities.

.02 SETTING VALVES

A. Provide services of technical representative of valve manufacturer on site during installation of valves and to serve as adviser on aspects of installation. Take necessary precautions to protect pilot system during PRV installation.

B. Prior to installing valves, remove foreign matter from within valves. Inspect valves in open and closed position to verify that parts are in satisfactory working condition.

.03 DISINFECTION AND TESTING

A. Disinfect valves and appurtenances as required by Section 02514 - Disinfection of Water Lines and test as required by Section 02515 - Hydrostatic Testing of Pipelines.

.04 PAINTING OF PIPING AND VALVES

A. Paint piping and valves located in vaults, stations, and above ground using ACRO Paint No. 2215, or approved equal.

END OF SECTION

SECTION 02525

TAPPING SLEEVES AND VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tapping sleeves and valves for connections to existing water system.

1.02 REFERENCES

A. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

B. ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

C. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High-Temperature Service

D. AWWA C 110 - Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.

E. AWWA C 200 - Standard for Steel Water Pipe - 6 in. and Larger.

F. AWWA C 207 - Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in.

G. AWWA C 500 - Standard for Metal Seated Gate Valves, for Water Supply Service.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit results of tapping sleeves NPT test opening.

C. Submit manufacturer's affidavit as required in Section 02521 - Gate Valves.

1.04 DELIVERY, STORAGE AND HANDLING

A. Ship steel sleeves in wooden crates that provide protection from damage to epoxy coating during transport and storage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Tapping Sleeves:

1. Tapping Sleeve Bodies: AWWA C 110 cast or ductile iron or AWWA C 200 carbon steel in two sections to be bolted together with high-strength, corrosion-resistant, low-alloy steel bolts with mechanical joint ends.

2. Branch Outlet of Tapping Sleeve:

   a. Flanged, machined recess, AWWA C 207, Class D, ANSI 150 pound drilling.

   b. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.

3. Use cast iron split sleeve where fire service from 6-inch watermain is approved.

B. Welded-steel tapping-sleeve bodies may be used in lieu of cast or ductile iron bodies for following sizes and with following restrictions:

1. Flange: AWWA C 207, Class D, ANSI 150 pound drilling.

2. Gasket: Affixed around recess of tap opening to prevent rolling or binding during installation.

3. Steel sleeves are restricted to use on pipe sizes 6 inches and larger.

4. Body: Heavy, welded-steel construction; top half grooved to retain neoprene 0-ring seal permanently against outside diameter of pipe.

5. Bolts: AWWA C 500 Section 3.5; coated with 100 percent vinyl resin or corrosive resistant material.
6. Steel Sleeves Finish: Fusion-bonded epoxy coated to minimum 12 mil thickness.

7. Finished Epoxy Coat: Free of laminations and blisters; and remain pliant and resistant to impact with non-peel finish.

8. Provide approved steel tapping sleeves

9. Tapping Sleeves: Provide with 3/4-inch NPT test opening for testing prior to tapping. Provide 3/4-inch bronze plug for opening.

10. Do not use steel sleeves for taps greater than 75 percent of pipe diameter.

C. Stainless Steel tapping-sleeve bodies and flange may be used in lieu of cast or ductile iron bodies for following sizes and with following restrictions:

1. Flange: ASTM A240 Stainless Steel, Type 304, ANSI 150 pound drilling.

2. Gasket: Full circumferential, affixed around recess of tap opening to prevent rolling or binding during installation, compounded for water and sewer service.

3. Stainless Steel sleeves are restricted to use on pipe sizes 4 inches and larger.

4. Body: ASTM A240 Stainless Steel, Type 304.

5. Bolts: ASTM A193 Stainless Steel, Type 304.

6. Nuts: ASTM A194 Stainless Steel, Type 304

7. Branch Outlet: Heavy Stainless Steel Pipe

8. Provide approved stainless steel tapping sleeves.

9. Do not use stainless steel sleeves for taps greater than 75 percent of pipe diameter.

D. Tapping Valves: Meet requirements of Section 02521 - Gate Valves with following exceptions:

1. Inlet Flanges:

   a. AWWA C 110; Class 125.

   b. AWWA C 110; Class 150 and higher: Minimum 8-hole flange.

2. Outlet: Standard mechanical or push-on joint to fit any standard tapping machine.
3. Valve Seat Opening: Accommodate full-size shell cutter for nominal size tap without contact with valve body; double disc.

D. Valve Boxes: Standard Type "A" valve boxes conforming to requirements of Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

PART 3 EXECUTION

3.01 APPLICATION

A. Install tapping sleeves and valves at locations and of sizes shown on Drawings. Install sleeve so valve is in horizontally level position unless otherwise indicated on Drawings.

B. Clean tapping sleeve, tapping valve, and pipe prior to installation and in accordance with manufacturer's instructions.

C. Hydrostatically test installed tapping sleeve to 150 psi for minimum of 15 minutes. Inspect sleeve for leaks, and remedy leaks prior to tapping operation.

D. When tapping concrete pressure pipe, size on size, use shell cutter one standard size smaller than water line being tapped.

E. Do not use Large End Bell (LEB) increasers with next size tap unless existing pipe is asbestos-cement.

3.02 INSTALLATION

A. Verify outside diameter of pipe to be tapped prior to ordering sleeve.

B. Tighten bolts in proper sequence so that undue stress is not placed on pipe.

C. Align tapping valve properly and attach to tapping sleeve. Insert insulation sleeves into flange holes of tapping valve and pipe. Make insertions of sleeves on pipe side of tapping valve. Do not damage insulation sleeves during bolt tightening process.

D. Make tap with sharp, shell cutter:

1. For 12-inch and smaller tap, use minimum cutter diameter one-half inch less than nominal tap size.

2. For 16-inch and larger tap, use manufacturer's recommended cutter diameter.

E. Withdraw coupon and flush cuttings from newly- made tap.

F. Wrap:

1. For 12-inch and smaller tap, wrap completed tapping sleeve and valve in accordance with Section 02528 - Polyethylene Wrap.

2. For 16-inch and larger tap, apply coal tar epoxy around completed tapping sleeve and valve. The coal tar epoxy shall be applied with minimum of two (2) coats. Each coat of coal tar epoxy shall have minimum dry film thickness of 16 mils.

G. Place concrete thrust block behind tapping sleeve (not over tapping sleeve and valve).

H. Request inspection of installation prior to backfilling.

I. Backfill in accordance with Section 02317 - Excavation and Backfill for Utilities.

END OF SECTION

SECTION 02526

WATER METERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water meters, sub-meters, and fire service meters.

1.02 REFERENCES

A. ASME B 16.1 - Cast-Iron Pipe Flanges and Flanged Fittings.

B. AWWA C 510 - Standard for Double Check Valve Backflow - Prevention Assembly.

C. AWWA C 700 - Standard for Cold-Water Meters - Displacement Type.

D. AWWA C 701 - Standard for Cold-Water Meters - Turbine Type for Customer Service.

E. AWWA C 702 - Standard for Cold-Water Meters - Compound Type.

F. AWWA C 703 - Standard for Cold-Water Meters - Fire Service Type.

G. AWWA Manual M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit written certification of calibration and test results.

C. Submit manufacturer's certification that water meters meet applicable requirements of this Specification Section.

D. Submit accuracy registration test certification from manufacturer for each 3-inch through 10 inch diameter meter.

1.04 QUALITY CONTROL

A. Submit manufacturer's warranty against defects in materials and workmanship for one (1) year from date of Substantial Completion.

B. Provide vendor's unconditional guarantee that performance of each meter meets applicable AWWA standards and AWWA Manual M6 as follows:

1. Displacement type: 10 years from installation or register registration shown below, whichever comes first.

Size (inch)	Registration (million gallons)
5/8,3/4	1.5
1	2.5
1-1/2	5.0
2	10.5

2. Turbine type: 1 year from date of installation.
3. Compound type: 1 year from date of installation.
4. Fire service type: 1 year from date of installation,

Operations of hermetically sealed register, 5/8-inch to 2-inch diameter, shall be unconditionally guaranteed for 15 years.

C. Provide manufacturer's unconditional guarantee for each sealed register against leakage, fogging, discoloration and stoppage for 15 years from date of Installation.

D. Vendor may replace meters that become defective within guarantee period with meters that comply with this Specification. Defective meters will be returned to the vendor at vendor’s expense. Meters repaired or replaced under this guarantee must meet accuracy limits for new meters upon receipt and accuracy limits for remaining period of initial guarantee.

1.05 EASEMENT REQUIREMENTS

A. Install 2-inch and smaller water meters and shut-off valves (stop boxes) at right-of-way line when possible. Otherwise, install within 5 foot by 5 foot water meter easement.

B. Except for 10-inch fire service compound water meters, install 3-inch and larger water meters within minimum of 10 foot by 20 foot water meter easement.

C. Install 10-inch fire service proportional or compound water meters within minimum of 10-foot by 25-foot water meter easement.

D. Locate water meter easements contiguous with public right-of-way unless approved by Contracting Officer. Provide minimum fifteen-foot wide access easement when not contiguous with public right-of-way.

PART2 PRODUCTS

2.01 GENERAL

A. Provide meters of type and size as indicated on Drawings, unless otherwise indicated.

B. Provide bolted split casings. Main casings of meters and external fasteners: Copper alloy with minimum 75 percent copper for 5/8 inch to 2 inches, bronze or cast iron, hot-dipped galvanized or epoxy coating for 3 inches and larger.

C. Straightening Vanes: Non-corrosive material compatible with case material.

D. Intermediate gear train shall not come into contact with water and shall operate in suitable lubricant.

E. Registers: Automatic Meter Reading (AMR) type that provides pulse, contact closure, piezo switch or encoder generated output signal, compatible with AWS radio and telephone AMR systems. Provide minimum 12-foot wire when permanently connected to register. Lens: impact resistant. Register box: tamper resistant by means of tamper screw or plug: Register: permanently sealed, straight-reading, center-sweep test hand, magnetic driven, U.S. gallons. Digits: 6, black in color, with lowest registering 3 digits (below 1,000-gallon registration) having contrasting digit and background color. Register capacity of meters: 9.99 million gallons for 5/8 inch to 2 inches and 999.999 million gallons for 3 inches and larger.

F. Connections: 5/8 inch to 1 inch: threads at each end; 1-1/2 to 2 inches: 2-bolt oval flanges each end; 3 inches and larger: flange at each end.

G. Stamp manufacturer's meter serial number on outer case. Stamp manufacturer's meter serial number on outside of register lid when provided. Manufacturer's serial numbers shall be individual and not duplicated.

H. Water Meters: Provide approved meters equip with AMR type register to connect to American Water AMR system.Water Meter to be: ‘Neptune Model T10’ (ProRead Gallon 6 wheel plastic bottom) with ‘Neptune Model R900v2 – pit style MIU c/w 6-ft of wire) with no substitutions. Water Meter to be supplied with a ‘McDonald’ Cast Iron Yoke as shown on standard detail drawings for locations where directed by Contracting Officer.

I. Manufacturing Quality Control shall permit successful interchangeability from one meter to another of same size including registers, measuring chambers and units, discs or pistons as units, change gears, bolts, nuts, and washers without affecting accuracy of new meter.

J. For water meter vaults provide:

1. Water Meter Vault to be: 'Alliance Model 16 AMR Series' as manufactured by 'DFW Plastics INC. Minimum outside dimensions, 25 ¼ " x 19 3/8". 'AMR' – 'Automatic Meter Reader' type lid shall be provided with a horseshoe type opening cover plate for the installation of the antenna for the MIU. Provide meter box extensions as manufactured by 'Alliance' to suit depth of water meter installation.

2. 1/4-inch steel or aluminum with stainless steel hinge pins. Door shall open to 90 degrees and automatically lock in that position.

3. Provide approved meter vault covers.

2.02 METER APPLICATIONS

A. Sizes 5/8-inch to 2-inch Meters: Displacement type (except for constant flow where 2-inch turbine may apply).

B. Sizes 3-inch and above Meters:

1. Turbines:

Lawn sprinkler systems
Sewer credit/sub-meter

2. Compounds:

Motels and hotels
Schools
Restaurants
Office buildings
Dormitories, nursing homes, department stores, shopping malls, and other commercial establishments

Note: Provide fire service type for sizes larger than 6 inches.

3. Fire Service Type: For designated fire protection lines. Provide proportional or compound type fire service meter assembly (AWWA C 703) when customer elects to use combination of potable and fire protection services in lieu of separate domestic meters and fire services.

2.03 MATERIALS

A. Cold-Water Meters:

1. Displacement Type: AWWA C 700; sizes 5/8 inch up to and including 2 inches; oscillating disc or piston of magnetic drive type; bolted split-case design, with either being removable.

2. Turbine Type: AWWA C 701; Class II; sizes 3 inches through 10 inches; flanged; straight-through measuring chamber; rotor construction: polypropylene or similar non rubber material with specific gravity of approximately 1.0, equipped with near frictionless replaceable bearings in turbine working against rotor shaft positioned thrust bearing. Transient/Fire Hydrant Meter Inlet: Female fitting for attachment to hose nozzle with National Standard Fire hose thread. Outlet: 2-inch nipple with National Pipe Thread. Include restriction plate to limit flow through meter to 400 gpm at 65 psi.

3. Compound Type: AWWA C 702; sizes 2 inches through 6 inches. Measuring chambers: For use in continuous operation; separate units of copper alloy (minimum 84 percent copper) or approved polymer material, inert in corrosive potable water; with centering device for proper positioning. Measuring pistons: Non-pilot type with division plates of rubber covering vulcanized to stainless steel or other approved material of sufficient thickness to provide minimum piston oscillation noise. Measuring discs: Flat or conical type, one piece, mounted on monel or 316 stainless steel spindle. Measuring chamber strainer screen area: Twice area of main case inlet.

4. Fire-Service Type: sizes 4 inches through 10 inches; turbine-type, compound type, proportional type; AWWA C 703, with separate check valve conforming to AWWA C 510. Determine size of fire meter by adding fire flow and domestic flow.

2.04 STRAINERS

A. Displacement Potable Water Meters 5/8 inch through 2 inches: Self-straining by means of annular space between measuring chamber and external case or with strainer screens installed in meter. Provide rigid screens which fit snugly, are easy to remove, with effective straining area at least double that of main case inlet.

B. Potable Water Meters 2-inch diameter and larger: Equip with separate external strainer with bronze body for diameters less than 8 inches. 8-inch diameter and larger may be cast iron, hot-dipped galvanized or epoxy coating. Strainers: Bolted to inlet side of meter, detachable from meter, easily removable lid. Strainer screen: Made of rounded cast bronze, stainless steel wire, having nominal screen size of 3-1/2 mesh-per-inch (U.S. Series) not less than 45 percent clear area.

C. Provide separate approved external strainers (when required by meter manufacturer) approved for use in fire service metered connections by Underwriters Laboratories. Bodies: Cast iron or copper alloy. Ends: Flanged in accordance with ASME B 16.1, Class 125. Provide stainless steel basket. Strainers shall be detachable from meter.

2.05 CONNECTIONS AND FITTINGS

A. Provide pipe for connections in accordance with Section 02501 - Ductile Iron Pipe and Fittings and Section 02506 - Polyvinyl Chloride Pipe. Use restrained joints and flanged joints only.

B. Fittings:

1. For meters 2 inches and smaller: Same type of fittings as Outlet End fittings for Curb Stop in accordance with Section 02512 - Water Tap and Service Line Installation.

2. For meters 3 inches and larger: Restrained ductile iron; push-on bell joints or mechanical joint fittings between water line and meter vault; Class 125 flanged inside meter vaults; cement mortar lined and sealed.

2.06 LAYING LENGTHS

A. Minimum laying lengths for meter and standard strainer shall be as shown on Drawings.

PART 3 EXECUTION

3.01 TAPPING AND METER SERVICE INSTALLATION

A. Meter Service Line:

1. Use pipe and fittings conforming to requirements of Section 02501 - Ductile Iron Pipe and Fittings, or Section 02506 - Polyvinyl Chloride Pipe.

2. Limit pulling and deflecting of joints to limits recommended by manufacturer.

3. Make vertical adjustments with offset bends where room will permit. Minimize number of bends.

4. Provide minimum of ten pipe diameters of straight pipe length upstream and downstream of meter vault.

3.02 METER FITTING HOOKUP

A. Support meter piping and meter, level and plumb, during installation. Support meters 3 inches and larger with concrete at minimum of two locations.

B. Use round flanged fittings inside meter box or vault except for mechanical joint to flange adapter. Provide full-face 1/8-inch black neoprene or red rubber

gasket material on flanged joints. Provide bolts and nuts made from approved corrosion-resistant material.

C. Tighten bolts in proper sequence and to correct torque.

D. Visually check for leaks under normal operating pressure following installation. Repair or replace leaking components.

3.03 METER BOX AND VAULT INSTALLATION

A. Conform to requirements of Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

B. Perform adjustment to existing meter in accordance with Section 02085 - Valve Boxes, Meter Boxes, and Meter Vaults.

3.04 TESTING

A. Accuracy registration tests will be conducted in accordance with latest revision of AWWA standard for type and size of meter.

1. Tests will be run by Contractor on meters prior to installation at manufacturing plant with attendance of Contracting Officer. Meters 2 inches and smaller will be tested at random at Contracting Officer's discretion. All 3 inches and larger meters will be tested.

2. Accuracy of displacement meters during guarantee period shall be as follows:
   a. Initial period: of 18 months from date of shipment or 12 months from date of installation: 98.5% to 101.5% at standard and minimum flow rates; 98% to 101% at low flow rates.
   b. Second period: AWWA new meter accuracy as tested below.

	GUARANTEE PERIOD			TEST FLOW RATE
Meter Size (inches)	Age of Meter (Years)	Or	Million* Gallons	Minimum Rate (gpm)
5/8	>1 to <5		0.5	1/4
1	>1 to <5		1.0	3/4
1-1/2	>1 to <5		2.5	1-1/2
2	>1 to <5		5.5	2

* Total registration.

   c. Third period: AWWA new meter accuracy for standard flow rates and AWWA repair meter accuracy for minimum flow rate as tested below.

GUARANTEE PERIOD TEST FLOW RATE

Meter Size (inches)	Age of Meter (Years)	Or	Million* Gallons	Minimum Rate (gpm)
5/8	>5 to <10		1.5	1/4
1	>5 to <10		2.5	3/4
1-1/2	>5 to <10		5.0	1-1/2
2	>5 to <10		10.0	2

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3. Minimal acceptable accuracy in percent of low flow registration for turbine meters:

Meter Size (inches)	Minimum Flow (gpm)	% Accuracy Required
2	3	95
3	5	95
4	15	95
6	20	95
8	20	95
10	30	95

END OF SECTION

SECTION 02528

POLYETHYLENE WRAP

PART 1 GENERAL

.01 SECTION INCLUDES

A. Polyethylene wrap to be used in open-cut construction for cast iron and ductile iron pipe when cathodic protection system is not required by Drawings.

.02 REFERENCE

A. ASTM D 1248 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials For a Wire and Cable.

B. AWWA C 105 - Standard for Polyethylene Encasement for Ductile-Iron Pipe System.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit product data for proposed film and tape for approval.

PART 2 PRODUCTS

.01 MATERIALS

A. Polyethylene Film: Tubular or sheet form without tears, breaks, holidays, or defects; conforming with requirements of AWWA C 105, 2.5 to 3 percent carbon black content, either low- or high-density:

1. Low-density polyethylene film. Low-density polyethylene film shall be manufactured of virgin polyethylene material conforming to following requirements of ASTM D 1248.

a. Raw material.

1. Type 1

2. Class: C (black).

3. Grade: E-5.

4. Flow rate (formerly melt index): 0.4 g/10 minute, maximum.

5. Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum

b. Physical properties.

1. Tensile strength: 1,200 psi, minimum.

2. Elongation: 300 percent, minimum.

3. Dielectric strength: 800 V/mil thickness, minimum.

c. Thickness: Low-density polyethylene film shall have normal thickness of 0.008 inch. Minus tolerance on thickness is 10 percent of nominal thickness.

2. High-density, cross-laminated polyethylene film. High-density, cross laminated polyethylene film shall be manufactured of virgin polyethylene material conforming to following requirements of ASTM D 1248

a. Raw material.

1. Type: III.

2. Class: C (black)

3. Grade: P33.

4. Flow rate (formerly melt index): 0.4 to 0.5g/10 minute, maximum.

5. Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum.

b. Physical properties.

1. Tensile strength: 5000 psi, minimum.

2. Elongation: 100 percent, minimum.

3. Dielectric strength: 800 V/mil thickness, minimum.

c. Thickness: Film shall have nominal thickness of 0.004 inch. Minus tolerance of thickness is 10 percent of nominal thickness.

B. Polyethylene Tape: Provide 3-inch-wide, plastic-backed, adhesive tape; Paleocene No. 900, Scotchwrap No. 50, or approved equal.

PART 3 EXECUTION

.01 PREPARATION

A. Remove lumps of clay, mud, and cinders from pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

B. Fit polyethylene film to contour of pipe to affect snug, but not tight fit; encase with minimum space between polyethylene and pipe. Allow sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to polyethylene due to backfilling operations. Secure overlaps and ends with adhesive tape to hold polyethylene encasement in place until backfilling operations are complete.

C. For installations below water table or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.

.02 INSTALLATION

A. Tubular Type (Method A):

1. Cut polyethylene tube to length approximately 2 feet longer than pipe section. Slip tube around pipe, centering tube to provide 1-foot overlap on each adjacent pipe section, and bunching it accordion-fashion lengthwise until it clears pipe ends.
2. Lower pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene tube.
3. After assembling pipe joint, make overlap of polyethylene tube. Pull bunched polyethylene from preceding length of pipe, slip it over end of adjoining length of pipe, and secure in place. Then slip end of polyethylene from adjoining pipe section over end of first wrap until it overlaps joint at end of preceding length of pipe. Secure overlap in place. Take up slack width at top of pipe to make snug, but not tight, fit along barrel of pipe, securing fold at quarter points.
4. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

B. Tubular Type (Method B):

1. Cut polyethylene tube to length approximately 1 foot shorter than pipe section. Slip tube around pipe, centering it to provide 6 inches of bare pipe at each end. Take up slack width at top of pipe to make snug, but not tight, fit along barrel of pipe, securing fold at quarter points; secure ends.
2. Before making up joint, slip 3-foot length of polyethylene tube over end of preceding pipe section, bunching in accordion-fashion lengthwise. After completing joint, pull 3foot length of polyethylene over joint, overlapping polyethylene previously placed on each adjacent section of pipe by at least I foot; make each end snug and secure.
3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

C. Sheet Type:

1. Cut polyethylene sheet to length approximately 2 feet longer than pipe section. Center length to provide 1-foot overlap on each adjacent pipe section, bunching sheet until it clears pipe ends. Wrap polyethylene around pipe so that sheet circumferentially overlaps top quadrant of pipe. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.
2. Lower wrapped pipe into trench and makeup pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene. After completing joint, make overlap and secure ends.
3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

D. Pipe-shaped Appurtenances: Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in same manner as pipe.

E. Odd-shaped Appurtenances: When it is not practical to wrap valves, tees, crosses, and other odd-shaped pieces in tube, wrap with flat sheet or split length of polyethylene tube by passing sheet around appurtenance and encasing it. Make seams by bringing edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

F. Openings in Encasement: Create openings for branches, service taps, blow-offs, air valves, and similar appurtenances by making X-shaped cut in polyethylene and temporarily folding back film. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene, with tape. Service taps may also be made directly through polyethylene, with resulting damaged areas being repaired as specified.

G. Junctions between Wrapped and Unwrapped Pipe: Where polyethylene-wrapped pipe joins adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for distance of at least 3 feet. Secure end with circumferential turns of tape. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of 3 feet away from cast or ductile iron pipe.

.03 REPAIRS

A. Repair cuts, tears, punctures, or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

END OF SECTION

SECTION 02531

GRAVITY SANITARY SEWERS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Gravity sanitary sewers and appurtenances, including stacks and service connections.

.02 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit proposed methods, equipment, materials and sequence of operations for sewer construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

C. Test Reports: Submit test reports and inspection videos as specified in Part 3 of this Section. Video tapes become property of Contracting Officer.

.03 QUALITY ASSURANCE

A. Qualifications. Install sanitary sewer that is watertight both in pipe-to-pipe joints and in pipeto-manhole connections. Perform testing in accordance with Section 02533 - Acceptance Testing for Sanitary Sewers.

B. Regulatory Requirements.

1. Install sewer lines to meet minimum separation distance from potable water line, as scheduled below. Separation distance is defined as distance between outside of water pipe and outside of sewer pipe. When possible, install new sanitary sewers no closer to water lines than 9 feet in all directions. Where this separation distance cannot be achieved, new sanitary sewers shall be installed as specified in this section.

2. Make notification to Contracting Officer when water lines are uncovered during sanitary sewer installation where minimum separation distance cannot be maintained.

3. Lay gravity sewer lines in straight alignment and grade.

.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Inspect pipe and fittings upon arrival of materials at job site.

B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear or free fall. Do not drag pipe and fittings along ground. Do not roll pipe unrestrained from delivery trucks.

C. Use mechanical means to move or handle pipe. Employ acceptable clamps, rope or slings around outside barrel of pipe and fittings. Do not use hooks, bars, or other devices in contact with interior surface of pipe to lift or move lined pipe.

PART 2 PRODUCTS

.01 PIPE

A. Provide piping materials for gravity sanitary sewers of sizes and types indicated on Drawings or as specified.

B. Unlined reinforced concrete pipe is not acceptable.

.02 PIPE MATERIAL SCHEDULE

A. Unless otherwise shown on Drawings, use pipe materials that conform to requirements specified in one or more of following Sections:

1. Section 02427 - Plastic Liner for Large-Diameter Concrete Sewers and Structures.
2. Section 02501 - Ductile Iron Pipe and Fittings.
3. Section 02505 - High Density Polyethylene (HDPE) Solid and Profile Wall Pipe.
4. Section 02506 - Polyvinyl Chloride Pipe.

B. Where shown on Drawings, provide pipe meeting minimum class, dimension ratio, or other criteria indicated.

C. Pipe materials other than those listed above shall not be used for gravity sanitary sewers.

.03 APPURTENANCES

A. Stacks. Conform to requirements of Section 02534 - Sanitary Sewer Service Stubs or Reconnections.

B. Service Connections. Conform to requirements of Section 02534 - Sanitary Sewer Service Stubs or Reconnections.

C. Roof, street or other type of surface water drains shall not be connected or reconnected into sanitary sewer lines.

.04 BEDDING, BACKFILL, AND TOPSOIL MATERIAL

A. Bedding and Backfill: Conform to requirements of Section 02317 - Excavation and Backfill for Utilities, Section 02320 - Utility Backfill Materials.

B. Topsoil: Conform to requirements of Section 02911 - Topsoil.

PART 3 EXECUTION

.01 PREPARATION

A. Prepare traffic control plans and set up street detours and barricades in preparation for excavation when construction will affect traffic. Conform to requirements of Traffic Control and Regulation.

B. Provide barricades, flashing warning lights, and warning signs for excavations. Conform to requirements of Traffic Control and Regulation. Maintain barricades and warning lights where work is in progress or where traffic is affected.

C. Perform work in accordance with OSHA standards. Employ trench safety system for excavations over 5 feet deep.

D. Immediately notify agency or company owning utility line which is damaged, broken or disturbed. Obtain approval from Contracting Officer and agency or utility company for repairs or relocations, either temporary or permanent.

E. Remove old pavements and structures including sidewalks and driveways in accordance with requirements of Section 02221 - Removing Existing Pavements and Structures.

F. Install and operate dewatering and surface water control measures in accordance with contract document requirements.

G. Do not allow sand, debris or runoff to enter sewer system.

.02 DIVERSION PUMPING

A. Install and operate required bulkheads, plugs, piping, and diversion pumping equipment to maintain sewage flow and to prevent backup or overflow. Obtain approval for diversion pumping equipment and procedures from Contracting Officer.

B. Design piping, joints and accessories to withstand twice maximum system pressure or 50 psi, whichever is greater.

C. No sewage shall be diverted into area outside of sanitary sewer.

D. In event of accidental spill or overflow, immediately stop overflow and take action to clean up and disinfect spillage. Promptly notify Contracting Officer so that required reporting can be made to State Environmental Agency and Environmental Protection Agency by Contracting Officer and AW Project Manager.

.03 EXCAVATION

A. Earthwork. Conform to requirements of Section 02317 - Excavation and Backfill for Utilities. Use bedding as indicated on Drawings.

B. Line and Grade. Establish required uniform line and grade in trench from benchmarks identified by Contracting Officer. Maintain this control for minimum of 100 feet behind and ahead of pipe-laying operation. Use laser beam equipment to establish and maintain proper line and grade of work. Use of

appropriately sized grade boards which are substantially supported is also acceptable. Protect boards and location stakes from damage or dislocation.

C. Trench Excavation. Excavate pipe trenches to depths shown on Drawings and as specified in Section 02317 - Excavation and Backfill for Utilities.

.04 PIPE INSTALLATION BY OPEN CUT

A. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

B. Install pipe only after excavation is completed, bottom of trench fine graded, bedding material is installed, and trench has been approved by Contracting Officer.

C. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

D. Install pipe with spigot ends toward downstream end of flow such that water flows into bell and out the spigot.

E. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

F. Keep interior of pipe clean as installation progresses. Remove foreign material and debris from pipe

G. Provide lubricant, place and drive home newly laid sections with come-a-long winches so as to eliminate damage to sections. Install pipe to "home" mark where provided. Use of back hoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by Contracting Officer.

H. Keep excavations free of water during construction and until final inspection.

I. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

J. Where gravity sanitary sewer is to be installed under existing water line with separation distance of at least 2 feet and less than 9 feet, install new sewer pipe so that one full 18 foot long pipe is centered on water line crossing. Embed sewer pipe in cement stabilized sand for minimum distance of 9 feet on each side of crossing.

K. Where gravity sanitary sewer is to be installed under existing water line with separation distance of less than 2 feet, install new sewer using pressure-rated pipe as shown on Drawings. Maintain minimum 6-inch separation distance.

L. Where the length of the stub is not indicated, install the stub to the right-of-way line and seal the free end with an approved plug.

.05 PIPE INSTALLATION OTHER THAN OPEN CUT

A. For installation of pipe by augering, jacking, or tunneling, conform to requirements of specification sections on tunneling augering, jacking and microtunneling work as appropriate.

.06 INSTALLATION OF APPURTENANCES

A. Service Connections. Install service connections to conform to requirements of Section 2534 - Sanitary Sewer Service Stubs or Reconnections.

B. Stacks. Construct stacks to conform to requirements of 02534 - Sanitary Sewer Service Stubs or Reconnections.

C. Construct manholes to conform to requirements of Section 02081 - Cast-in-Place Concrete Manholes, Section 02082 - Precast Concrete Manholes as applicable. Install frames, rings, and covers to conform to requirements of Section 02084 - Frames, Grates, Rings, and Covers.

.07 INSPECTION AND TESTING

A. Visual Inspection: Check pipe alignment in accordance with Section 02533 - Acceptance Testing for Sanitary Sewers.

B. Mandrel Testing. Use Mandrel Test to test flexible pipe for deflection. Refer to Section 02533 - Acceptance Testing for Sanitary Sewers.

C. Pipe Leakage Test. After backfilling line segment and prior to tie-in of service connections, visually inspect gravity sanitary sewers where feasible, and test for leakage in accordance with Section 02533 - Acceptance Testing for Sanitary Sewers.

.08 BACKFILL AND SITE CLEANUP

A. Backfill and compact soil in accordance with Section 02317 - Excavation and Backfill for Utilities.

B. Backfill trench in specified lifts only after pipe installation is approved by Project Manager.

C. Repair and replace removed or damaged pavement, curbs, gutters, and sidewalks as specified in Section 02951 - Pavement Repair and Resurfacing.

D. Provide hydromulch seeding in areas of commercial, industrial or undeveloped land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on Drawings. Provide minimum of 4 inches of topsoil as specified in Section 02911 - Topsoil and apply hydromulch according to requirements of Section 02921 - Hydromulch Seeding.

E. Provide sodding in areas of residential land use over surface of ground disturbed during construction and not paved or not designated to be paved. Grade surface at uniform slope to natural grade as indicated on Drawings. Provide minimum of

4 inches of topsoil per Section 02911 - Topsoil. Sod disturbed areas in accordance with Section 02922 - Sodding.

.09 POST-INSTALLATION TELEVISION INSPECTION

A. Prior to final acceptance of newly constructed gravity sanitary sewers, perform cleaning and closed circuit television inspection. Cleaning shall include utilizing variable pressure water nozzles (3000 psi) and collection, removal, transportation and disposal of sand, debris, and liquid wastes to legal disposal sites.

B. Select and use closed-circuit television equipment that will produce color video tape. Produce video tape using pan-and-tilt, radial viewing, pipe inspection camera that pans plus and minus 275 degrees and rotates 360 degrees. Use camera with accurate footage counter which displays on monitor exact distance of camera from starting manhole. Use camera with camera height adjustment so that camera lens is always centered at one-half inside diameter, or higher, in pipe being televised. Provide lighting system that allows features and condition of pipe to be clearly seen. Reflector in front of camera may be necessary to enhance lighting in dark or large diameter pipe.

C. Perform television inspection of gravity sanitary sewers as follows:

1. Videos shall pan beginning and ending manholes to demonstrate that debris has been removed. Camera operator shall slowly pan each service connection and where sewer transitions from one pipe material to another.

2. Video tapes shall be continuous for pipe segments between manholes. Do not leave gaps in video taping of segment between manholes and do not show single segment on more than one video tape.

3. No flow is allowed in gravity sanitary sewer while performing post-installation television inspection.

D. Provide video tapes in VHS format, recorded at Standard Play (SP). Two labels are required. Place one label on spine and other on face of each video tape. Permanently label each video tape with following information.

Spine of Tape

Wastewater File No.:_____ Contractor's Name:
Inspection Type: [ ] Survey [ ] Pre-Installation [ ] Post-Installation
Tape No.:_____ Date Televised:_____ Date Submitted:
Basin No:

Face of Tape

Manhole No. From	Manhole No. To	Pipe Diameter	Pipe Length	Street
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	

E. For each video tape provide completed TV Inspection Report, as attached at end of this section. TV Inspection Report is written/narrated log of pipe conditions and service connections, indexed to footage counter.

F. Upon completion of video tape reviews by Contracting Officer, Contractor will be notified regarding final acceptance of sewer segment.

END OF SECTION

SECTION 02532

SANITARY SEWER FORCEMAINS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Sanitary sewer forcemains.

.02 REFERENCE STANDARDS

A. ACI 318 - ACI Building Code and Commentary.

B. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 C and 30 C with a Vitreous Silica Dilatometer.

C. ASTM D 2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-FiberReinforced- Thermosetting-Resin) Pipe.

D. ASTM D 2992 - Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe and Fittings.

E. ASTM D 2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-FiberReinforced Thermosetting-Resin) Pipe.

F. Uni-Bell UNI-B-3 Polyvinyl Chloride (PVC) Pressure Pipe (complying with AWWA C 900).

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit proposed methods, equipment, materials, and sequence of operations for force main construction. Plan operations to minimize disruption of utilities to occupied facilities or adjacent property.

C. Force mains 24 inches in diameter and larger: Submit shop drawings and design calculations for joint restraint systems using reinforced concrete encasement of pressure pipe and fittings.

D. Submit qualifications, proposed methods, equipment, materials, and sequence for acceptance testing of pipeline. Submit evidence of experience with pipeline proving by pigging for at least three projects of equal or greater scope; project list shall include dates, size and length of pipe, location, owner name, contact person, and telephone number. Provide certificate of training by manufacturer of pigging equipment being used.

E. Submit test reports as specified in Part 3 of this Section.

PART 2 PRODUCTS

.01 PIPE FITTING MATERIAL SCHEDULE

A. Unless otherwise shown on Drawings, use pipe materials that conform to requirements specified in one or more of the following Sections:

1. Section 02501 - Ductile-Iron Pipe and Fittings.
2. Section 02505 - High Density Polyethylene Solid and Profile Wall Pipe (HDPE).
3. Section 02506 - Polyvinyl Chloride Pipe. Provide Lined Ductile-Iron Fittings in Accordance with Section 02501 - Ductile-Iron Pipe and Fittings.

.02 THRUST RESTRAINT

A. Unless otherwise shown on Drawings, provide concrete thrust blocking for force mains up to 12-inches in diameter, to prevent movement of buried lines under pressure at bends, tees, caps, valves and hydrants. Blocking shall be Portland cement concrete, as specified in Concrete for Utility Construction. Place concrete in accordance with details on Drawings. Place thrust blocks between undisturbed ground and fittings. Anchor fittings to thrust blocks so that pipe and fitting joints are accessible for repairs. Concrete shall extend from 6 inches below pipe or fitting to 12 inches above.

B. For forcemains larger than 12 inches in diameter, and where indicated on Drawings, provide restrained joints conforming to requirements of force main pipe material specifications. Install restrained joints for length of pipe on both sides of each bend or fitting for full length shown on Drawings.

C. Horizontal and vertical bends between zero and 10 degrees deflection angle will not require thrust blocks or harnessed or restrained joints.

D. Horizontal and vertical bends between 10 degrees and 90 degrees deflection angle shall have thrust restraint or blocks as shown on Drawings.

E. Provide thrust blocks or restraint at tees, plugs, blowoff drains, valves, and caps, as indicated.

PART 3 EXECUTION

.01 PIPE INSTALLATION BY OPEN-CUT

A. Perform excavation, bedding, and backfill in accordance with Section 02317 - Excavation and Backfill for Utilities.

B. Wrap ductile-iron pipe and fittings with polyethylene wrap in accordance with requirements of Section 02528 - Polyethylene Wrap. Do not install polyethylene wrap on ductile iron pipe protected by cathodic protection system or fusion bonded or polyurethane coated fittings.

C. Install pipe in accordance with pipe manufacturer's recommendations and as specified in following paragraphs.

D. Install pipe only after excavation is completed, bottom of trench is fine graded, bedding material is installed, and trench has been approved by Contracting Officer.

E. Install pipe to line and grade indicated. Place pipe so that it has continuous bearing of barrel on bedding material and is laid in trench so interior surfaces of pipe follow grades and alignment indicated. Provide bell holes where necessary.

F. Install pipe with spigot ends toward direction of flow. Form concentric joint with each section of adjoining pipe so as to prevent offsets.

G. Keep interior of pipe clean as installation progresses. Where cleaning after laying pipe is difficult because of small pipe size, use suitable swab or drag in pipe and pull it forward past each joint immediately after joint has been completed. Remove foreign material and debris from pipe.

H. Provide lubricant, place and drive home newly-laid sections with come-a-long winches so as to eliminate damage to sections. Install pipe to "home" mark where provided. Use of back - hoes or similar powered equipment will not be allowed unless protective measures are provided and approved in advance by Contracting Officer.

I. Keep excavations free of water during construction and until final inspection.

J. When work is not in progress, cover exposed ends of pipes with approved plug to prevent foreign material from entering pipe.

K. Where sanitary sewer force main is to be installed under existing water line with separation distance of less than 2 feet, install one full joint length of pipe, minimum 18 foot length, centered on water line and maintain minimum 6-inch separation distance.

.02 PIPE INSTALLATION OTHER THAN OPEN-CUT

A. For installation of pipe by augering, jacking, or tunneling, conform to requirements of specification section of augering or tunneling work.

.03 HYDROSTATIC TESTING

A. After pipe and appurtenance have been installed, test line and drain. Prevent damage to Work or adjacent areas. Use clean water to perform tests.

B. Contracting Officer may direct tests of relatively short sections of completed lines to minimize traffic problems or potential public hazards.

C. Test pipe in presence of Contracting Officer.

D. Test pipe at 150 psig or 1.5 times design pressure of pipe, whichever is greater. Design pressure of force main shall be rated total dynamic head of lift station pump.

E. Test pipe at required pressure for minimum of 2 hours according to requirements of UNI-B-3.

F. Maximum allowable leakage shall be as calculated by following formula:

$$L = (S)\ (D)\ (P^{0.5})\ /\ 133{,}200$$

Where:	L	=	Leakage in gallons per hour.
	S	=	Length of pipe in feet.
	P	=	Inside diameter of pipe in inches.
	D	=	Pressure in pounds per square inch.

G. Correct defects, cracks, or leakage by replacement of defective items or by repairs as approved by Contracting Officer.

H. Plug openings in force main after testing and flushing. Use cast iron plugs or blind flanges to prevent debris from entering tested pipeline.

.04 PIGGING TEST

A. After completion of hydrostatic testing and prior to final acceptance, test force mains longer than 200 feet by pigging to ensure piping is free of obstructions.

B. Pigs: Provide proving pigs manufactured of open-cell polyurethane foam body, without coating or abrasives which would scratch or otherwise damage interior pipe wall surface or lining. Pigs shall be able to pass through reductions of up to 65 percent of nominal crosssectional area of pipe. Pigs shall be able to pass through standard fittings such as 45-degree and 90-degree elbows, crosses, tees, wyes, gate valves, or plug valves, as applicable to force main being tested.

C. Test Execution: Conduct pigging test in presence of Contracting Officer. Provide at least 48 hours notice of scheduled pigging of force main prior to commencing test.

END OF SECTION

SECTION 02533

ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Acceptance testing of sanitary sewers including:

1. Visual inspection of sewer pipes
2. Mandrel testing for flexible sewer pipes.
3. Leakage testing of sewer pipes.
4. Leakage testing of manholes.
5. Smoke testing of point repairs.

B. All tests listed in this Section are not necessarily required on this Project. Required tests are named in other Sections which refer to this Section for testing criteria and procedures.

.02 REFERENCES

A. ASTM C 828 - Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines.

B. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

C. ASTM D 3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

D. ASTM F 794 - Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

E. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.

.03 PERFORMANCE REQUIREMENTS

A. Gravity flow sanitary sewers are required to have straight alignment and uniform grade between manholes.

B. Flexible pipe, including "semi-rigid" pipe, is required to show no more than 5 percent deflection. Test pipe no sooner than 30 days after backfilling of line segment but prior to final acceptance using standard mandrel to verify that installed pipe is within specified deflection tolerances.

C. Maximum allowable leakage for Infiltration or Exfiltration

1. The total exfiltration, as determined by hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at minimum test head of

2 feet above crown of pipe at upstream manhole or 2 feet above groundwater elevation, whichever is greater.

2. When pipes are installed more than 2 feet below groundwater level, use infiltration test in lieu of exfiltration test. Total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Groundwater elevation must be at least 2 feet above crown of pipe at upstream manhole.

3. Refer to Table 02533-1, Water Test Allowable Leakage, at end of Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.

D. Perform air testing in accordance with requirements of this Section and the local state environmental agency requirements. Refer to Table 02533-2, Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, Table 02533-3, Minimum Testing Times for Low Pressure Air Test, and Table 02533-4, Vacuum Test Time Table, at end of this Section.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval by Contracting Officer. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from Drawings and Specifications.

C. Test Reports: Submit test reports for each test on each segment of sanitary sewer.

.05 GRAVITY SANITARY SEWER QUALITY ASSURANCE

A. Repair, correct, and retest manholes or sections of pipe which fail to meet specified requirements when tested.

B. Provide testing reports and video tape of television inspection as directed by Contracting Officer.

C. Upon completion of tape reviews by Contracting Officer, Contractor will be notified regarding final acceptance of sewer segment.

.06 SEQUENCING AND SCHEDULING

A. Perform testing as work progresses. Schedule testing so that no more than 1000 linear feet of installed sewer remains untested at one time.

B. Coordinate testing schedules with Contracting Officer. Perform testing under observation of Contrcting Officer.

PART 2 PRODUCTS

.01 DEFLECTION MANDREL

A. Mandrel Sizing. Rigid mandrel shall have outside diameter (O.D.) equal to 95 percent of inside diameter (I.D.) of pipe. Inside diameter of pipe, for purpose of determining outside diameter of mandrel, shall be average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and average inside diameter for I.D. controlled pipe, dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

B. Mandrel Design. Rigid mandrel shall be constructed of metal or rigid plastic material that can withstand 200 psi without being deformed. Mandrel shall have nine or more "runners" or "legs" as long as total number of legs is odd number. Barrel section of mandrel shall have length of at least 75 percent of inside diameter of pipe. Rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. Provide and use proving ring for modifying each size mandrel.

C. Proving Ring. Furnish "proving ring" with each mandrel. Fabricate ring of 1/2-inch-thick, 3-inch-wide bar steel to diameter 0.02 inches larger than approved mandrel diameter.

D. Mandrel Dimensions (5 percent allowance). Average inside diameter and minimum mandrel diameter are specified in Table 02533-5, Pipe vs. Mandrel Diameter, at end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in table may be used when approved by Contracting Officer.

.02 ENFILTRATION TEST

A. Water Meter: Obtain transient water meter from Contracting Officer furnished by AW for use when water for testing will be taken from AW system. Conform to AW requirements for water meter use.

B. Test Equipment:

1. Pipe plugs.
2. Pipe risers where manhole cone is less than 2 feet above highest point in pipe or service lead.

.03 INFILTRATION TEST

A. Test Equipment:

1. Calibrated 90 degree V-notch weir.
2. Pipe plugs.

.04 LOW PRESSURE AIR TEST

A. Minimum Requirement for Equipment:

1. Control panel
2. Low-pressure air supply connected to control panel.
3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of

withstanding internal test pressure without leaking or requiring external bracing.

4. Air hoses from control panel to:
   a. Air supply.
   b. Pneumatic plugs.
   c. Sealed line for pressuring.
   d. Sealed line for monitoring internal pressure.

B. Testing Pneumatic Plugs: Place pneumatic plug in each end of length of pipe on ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable when they remain in place against test pressure without external aids.

.05 GROUND WATER DETERMINATION

A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

.06 SMOKE TESTING

A. Equipment:
   1. Pneumatic plugs.
   2. Smoke generator as supplied by Superior Signal Company, or approved equal.
   3. Blowers producing 2500 scfm minimum.

PART 3 EXECUTION

.01 PREPARATION

A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.

B. Determine selection of test methods and pressures for gravity sanitary sewers based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Control of Ground Water and Surface Water.

.02 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

A. Check pipe alignment visually by flashing light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and relay or replace pipe segment.

.03 MANDREL TESTING FOR GRAVITY SANITARY SEWERS

A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034.

Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of line segment.

B. Pull approved mandrel by hand through sewer sections. Replace any section of sewer not passing mandrel. Mandrel testing is not required for stubs.

C. Retest repaired or replaced sewer sections.

.04 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS

A. Test Options:

1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.
2. Test new or rehabilitated sanitary sewer manholes with water or low pressure air. Manholes tested with low pressure air shall undergo physical inspection prior to testing.
3. Perform leakage testing after backfilling of line segment, and prior to tie-in of service connections.
4. If no installed piezometer is within 500 feet of sewer segment, provide temporary piezometer for this purpose.

B. Compensating for Ground Water Pressure:

1. Where ground water exists, install pipe nipple at same time sewer line is placed. Use 1/2-inch capped pipe nipple approximately 10 inches long. Make installation through manhole wall on top of sewer line where line enters manhole.
2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect clear plastic tube to nipple. Support tube vertically and allow water to rise in tube. After water stops rising, measure height in feet of water over invert of pipe. Divide this height by 2.3 feet/psi to determine ground water pressure to be used in line testing.

C. Exfiltration test:

1. Determine ground water elevation.
2. Plug sewer in downstream manhole.
3. Plug incoming pipes in upstream manhole.
4. Install riser pipe in outgoing pipe of upstream manhole when highest point in service lead (house service) is less than 2 feet below bottom of manhole cone.
5. Fill sewer pipe and manhole or pipe riser, when used, with water to point 2-1/2 feet above highest point in sewer pipe, house lead, or ground water table, whichever is highest.
6. Allow water to stabilize for one to two hours. Take water level reading to determine drop of water surface, in inches, over one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 02533-1 at end of this Section.

D. Infiltration test: Ground water elevation must be not less than 2.0 feet above highest point of sewer pipe or service lead (house service).

1. Determine ground water elevation.
2. Plug incoming pipes in upstream manhole.
3. Insert calibrated 90 degree V-notch weir in pipe on downstream manhole.
4. Allow water to rise and flow over weir until it stabilizes.
5. Take five readings of accumulated volume over period of 2 hours and use average for infiltration. Average must not exceed that calculated for 2 hours from allowable leakage according to Table 02533-1 at end of this Section.

E. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed in Table 02533-2.

1. Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
2. For pipe sections less than 36-inch average inside diameter:
   a. Determine ground water level.
   b. Plug both ends of pipe. For concrete pipe, flood pipe and allow 2 hours to saturate concrete. Then drain and plug concrete pipe.
   c. After manhole-to-manhole section of sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
   d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 02533-2 at end of this Section.
   e. To determine air loss, measure time interval for pressure to drop to 2.5 psig. Time must exceed that listed in Table 02533-2 at end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

F. Retest: Repair and retest any section of pipe which fails to meet requirements.

.05 TEST CRITERIA TABLES

A. Exfiltration and Infiltration Water Tests: Refer to Table 02533-1, Water Test Allowable Leakage, at end of this Section.

B. Low Pressure Air Test:

1. Times in Table 02533-2, Time Allowed For Pressure Loss From 3.5 psig to 2.5 psig, at end of this Section, are based on equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria 317.2(a)(4)(B). If the state where the project is being completed has more stringent times, the local state's requirements will apply.

		T = 0.0850(D)(K)/(Q)
where:	T =	Time for pressure to drop 1.0 pounds per square inch gauge in seconds
	K =	0.000419 DL, but not less than 1.0
	D =	Average inside diameter in inches
	L =	Length of line of same pipe size in feet
	Q =	Rate of loss, 0.0015 ft^3 /min./sq.ft. internal surface

2. Since K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 02533-3, Minimum Testing Times for Low Pressure Air Test.

Notes:

1. When two sizes of pipe are involved, compute time by ratio of lengths involved.

2. Lines with 27-inch average inside diameter and larger may be air tested at each joint.

3. Lines with average inside diameter greater than 36 inches must be air tested for leakage at each joint.

4. If joint test is used, perform visual inspection of joint immediately after testing.

5. For joint test, pipe is to be pressurized to 3.5 psi greater than pressure exerted by groundwater above pipe. Once pressure has stabilized, minimum times allowable for pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

.06 LEAKAGE TESTING FOR MANHOLES

A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.

B. Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged when lines entering manhole have not been backfilled.

C. Vacuum testing:

1. Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.

2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table 02533-4, Vacuum Test Time Table.

3. If drop in vacuum exceeds 1 inch Hg over specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

D. Perform hydrostatic exfiltration testing as follows:

1. Seal wastewater lines coming into manhole with internal pipe plug. Then fill manhole with water and maintain it full for at least one hour.
2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

.07 SMOKE TEST PROCEDURE FOR POINT REPAIRS

A. Application: Perform smoke test to:

1. Locate points of line failure for point repair.
2. Determine when point repairs are properly made.
3. Determine when service connections have been reconnected to rehabilitated sewer.
4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.

B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in single manhole section at one time. Keep number of open excavations to minimum.

C. Preparation: Prior to smoke testing, give written notices to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to local police and fire departments 24 hours prior to actual smoke testing.

D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal annular space at manhole for sliplined sections.

E. Smoke Introduction:

1. Operate equipment according to manufacturer's recommendation and as approved by Project Manager.
2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for minimum of 5 minutes.
3. Introduce smoke into upstream and downstream manhole as appropriate. Monitor tap/connection for smoke leaks. Note sources of leaks.

F. Repair and Retest: Repair and replace taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at time. When repair or replacement, testing or retesting, and backfilling

of excavation is not completed within one work day, properly barricade and cover each excavation as approved by Contracting Officer.

G. Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to newly installed liner pipe, perform dye test to confirm reconnection. Introduce dye into service line through plumbing fixture inside structure or sewer cleanout immediately outside structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms reconnection.

TABLE 02533-1
WATER TEST ALLOWABLE LEAKAGE

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	INCH	GALLONS	PIPE SIZE IN INCHES	GALLONS/MINUTE PER 100FT.
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	13	0.0066
3	7.0686	.0306	12	0.0079
4	12.5664	.0306	15	0.0099
5	19.6350	.0544	18	0.0118
6	28.2743	.1224	21	0.0138
8	50.2655	.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of daiameters by value of 1” diameter			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours	

* Allowable leakage rate shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when sewer is identified as located within 25-year flood plain

TABLE 02533-2
ACCEPTANCE TESTING FOR SANITARY SEWERS

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG														
Pipe Diam. (in)	**Min. Time (min:sec)**	**Length for min. time (ft)**	**Time for Longer Length (sec)**	**Specification Time for Length (L) shown (min:sec)**										
				100 ft	**150 ft**	**200 ft**	**250 ft**	**300 ft**	**350 ft**	**400 ft**	**450 ft**	**500 ft**	**550 ft**	**600 ft**
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12
10	9:27	239	2.3742	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33	100:58	115.24	129.49	144.14	158.40	173.05
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34

TABLE 02533-3
MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

PIPE DIAMETER (inches)	**MINIMUM TIME (seconds)**	**LENGTH FOR MINIMUM TIME (feet)**	**TIME FOR LONGER LENGTH (seconds)**
			0.855 (L)
6	340	398	1.520 (L)
8	454	298	2.374 (L)
10	567	239	3.419 (L)
12	680	199	5.342 (L)
15	850	159	7.693 (L)
18	1020	133	10.471 (L)
21	1190	114	13.676(L)
24	1360	100	17.309 (L)
27	1530	88	21.369 (L)
30	1700	80	25.856 (L)
33	1870	72	

DEPTH IN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48”	60”	72”
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
*	5.0	6.5	8.0
***Add T times for each additional 2-foot depth. (The values listed above have been extrapolated from ASTM C 924-85)**			

TABLE 02533-5
PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size (Inches)	Average I.D (Inches)	Minimum Mandrel Diameter (Inches)
PVC-Solid (SDR 26)6	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)12	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
	48	47.500	45.125
HDPE-Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
	60	60.000	57.000

Material and Wall Construction	Nominal Size (Inches)	Average I.D (Inches)	Minimum Mandrel Diameter (Inches)
Fiberglass	12	12.85	11.822
(Class SN 46)	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
	60	60.38	57.361

END OF SECTION

SECTION 02534

SANITARY SEWER SERVICE STUBS OR RECONNECTIONS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Installation of service stubs in sanitary sewers serving areas where sanitary sewer service did not previously exist.

B. Reconnection of existing service connections along parallel, replacement, or rehabilitated sanitary sewers.

.02 REFERENCES

A. ASTM D 1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

B. ASTM D 3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

C. ASTM D 3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

.03 PERFORMANCE REQUIREMENTS

A. Accurately locate in field all proposed service stubs along new sanitary sewer main.

B. Accurately locate in field existing service connections and proposed service stubs along alignment of new parallel or replacement sewer main.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit product data for each pipe product, fitting, coupling and adapter.

C. Show reconnected services on record drawings. Give exact distance from each service connection to nearest downstream manhole.

PART 2 PRODUCTS

.01 PVC SERVICE CONNECTION

A. As stub outs, use PVC sewer pipe of 4-inch through 10-inch diameter, conforming to ASTM D 1784 and ASTM D 3034, with cell classification of 12454-B. SDR (ratio of diameter to wall thickness) shall be 26 for pipe 10 inches in diameter or less.

B. PVC pipe shall be gasket jointed with gasket conforming to ASTM D 3212.

C. Provide service connection pipe in sizes shown on Drawings. For reconnection of existing services, select service connection pipe diameter to match existing service diameter. Reconnections to rehabilitated sanitary sewer mains shall be limited to following maximum service connection diameter:

Sewer Diameter	Maximum Service Connection Diameter
8” or less	4”
10” or less	6”

D. Subject to above limits, provide 6-inch service connection when more than one service discharges into single pipe.

E. Connect service pipes to parallel or replacement sewer mains with prefabricated, full-bodied tee or wye fittings conforming to specifications for sewer main pipe material as specified in other Sections for sewers up to 18 inches in diameter.

F. Where sewers are installed using pipe augering or tunneling, or where sewer is greater than 18 inches in diameter, use Fowler "Inserta-Tee" to connect service to sewer main.

.02 PIPE SADDLES

A. Use pipe saddles only on rehabilitated sanitary sewer mains. Comply with Paragraph 2.01E for new parallel and replacement sanitary sewer mains.

B. Supply one-piece prefabricated saddle, either polyethylene or PVC, with neoprene gasket to accomplish complete seal. Use saddle fabricated to fit outside diameter of connecting pipe. Protruding lip of saddle must be at least 5/8-inch long with grooves or ridges to retain stainless steel band clamps.

C. Use 1/2-inch stainless steel band clamps for securing saddles to liner pipe.

.03 COUPLINGS AND ADAPTERS

A. For connections between new PVC pipe stubouts and existing service, 4-, 6-, or 8-inch diameter, use flexible adapter coupling consisting of neoprene gasket and stainless steel shear rings with 1/2-inch stainless steel band clamps:

1. Fernco Pipe Connectors, Inc. Series 1055 with shear ring SR-8
2. Band Seal by Mission Rubber Co., Inc.
3. Approved equal.

B. For connections between new PVC pipe stubout and new service, use rubber-gasket adapter coupling:

1. GPK Products, Inc.
2. IPS & Sewer Adapter
3. Approved equal.

.04 STACKS

A. Provide stacks for service connections wherever crown of sewer is 8 feet or more below finished grade.

B. Construct stacks of same material as sanitary sewer and as shown on Drawings.

C. Provide stacks of same nominal diameter at sanitary service line.

.05 PLUGS AND CAPS

A. Seal upstream end of unconnected sewer service stubs with rubber gasket plugs or caps of same pipe type and size. Provide plugs or caps by GPK Products, Inc., or approved equal.

PART 3 EXECUTION

.01 PERFORMANCE REQUIREMENTS

A. Provide minimum of 72 hours notice to customers whose sanitary sewer service will potentially be interrupted.

B. Accurately field locate service connections, whether in service or not, along rehabilitated sanitary sewer main. For parallel and replacement sewers, service connections may be located as pipe laying progresses from downstream to upstream.

C. Properly disconnect existing connections from sewer and reconnect to rehabilitated liner, as described in this Section.

D. Reconnect service connections, including those that go to unoccupied or abandoned buildings or to vacant lots, unless directed otherwise by Contracting Officer.

E. Complete reconnection of service lines within 24 hours after cured-in-place liner installation and within 72 hours after disconnection for sliplining, parallel, or replacement sanitary sewer mains.

F. Reconnect services on cured-in-place liner at 12 feet depth or less by excavation method. Contracting Officer reserves right to require service connections by excavation when remote cut service connection damages lines.

G. Reconnection by excavation method shall include stack and fittings and required pipe length to reconnect service line.

H. Connect services 8 inches in diameter and larger to sewer by construction of manhole. Refer to appropriate Section on manholes for construction.

.02 PROTECTION

A. Provide barricades, warning lights, and signs for excavations created for service connections.

B. Do not allow sand, debris, or runoff to enter sewer system.

.03 PREPARATION

A. Determine existing sewer locations and number of existing service connections from closedcircuit television (CCTV) inspection tapes or from field survey. Accurately field locate existing service connections, whether in service or not. Use existing service locations to connect or reconnect service lines or liner.

B. For rehabilitated sanitary sewer mains, allow liner to normalize to ambient temperature and recover from imposed stretch. For cured-in-place liners, verify that liner is completely cured.

C. For new parallel and replacement sanitary sewer mains, complete testing and acceptance of downstream sewers as applicable. Provide for compliance with requirements of Paragraph 3.01E.

.04 EXCAVATION AND BACKFILL

A. Excavate in accordance with Section 02317 - Excavation and Backfill for Utilities.

B. Perform work in accordance with OSHA standards. Employ Trench Safety System as specified in Section 02260 - Trench Safety System for excavations requiring trench safety.

C. Install and operate necessary ground water and surface water control measures in accordance with requirements of the contract documents.

D. Determine locations where limited access, buildings or structure preclude use of mechanical excavation equipment. Obtain approval from Contracting Officer for hand excavation.

.05 RECONNECTION BY EXCAVATION METHOD

A. Remove portion of existing sanitary sewer main or carrier pipe to expose liner pipe. Provide sufficient working space for installing prefabricated pipe saddle.

B. Carefully cut liner pipe making hole to accept stubout protruding from underside of saddle.

C. Strap on saddle using stainless steel band on each side of saddle. Tighten bands to produce watertight seal of saddle gasket to liner pipe.

D. Remove and replace cracked, offset, or leaking service line for up to 5 feet, measured horizontally, from center of new liner.

E. Make up connection between liner and service line using PVC sewer pipe and approved fittings and couplings.

F. Test service connections before backfilling.

.06 RECONNECTION BY REMOTE METHOD

A. Make service reconnections using remote-operated cutting tools on cured-in-place liners at depth greater than 12 feet.

B. Employ method and equipment that restore service connection capacity to not less than 90 percent of original capacity.

C. Immediately open missed connections and repair holes drilled in error using method approved by Contracting Officer.

.07 RECONNECTION ON PARALLEL OR REPLACEMENT SEGMENTS

A. Install service connections on sewer main.

B. Remove and replace cracked, offset or leaking service line for up to 5 feet, measured horizontally, from centerline of sanitary sewer main.

C. Make up connection between main and existing service line using PVC sewer pipe and approved couplings, as shown on Drawings.

D. Test service connections before backfilling.

E. Embed service connection and service line as specified for sanitary sewer main as shown on Drawings. Place and compact trench zone backfill in compliance with Section 02317 - Excavation and Backfill for Utilities.

.08 INSTALLATION OF NEW SERVICE STUBS

A. Install service connections on sanitary sewer main for each service connection. Provide length of stub indicated on Drawings. Install plug or cap on upstream end of service stub as needed.

B. Test service connections before backfilling.

C. Embed service connection and service line as specified for sanitary sewer main, and as shown on Drawings. Place and compact trench zone backfill in compliance with Section 02317 - Excavation and Backfill for Utilities. Install minimum 2-foot length of magnetic locating tape along axis of service stub and 9 inches to 12 inches above crown of pipe, at end of stub.

.09 TESTING

A. Test service reconnections and service stubs. Follow applicable procedures given in Section 02533 - Acceptance Testing for Sanitary Sewers to perform smoke testing to confirm reconnection.

B. Perform post installation CCTV inspection as specified in the contract documents. Cleaning and Television Inspection to show locations of service connection.

.010 CLEANUP

A. Backfill excavation as specified in Section 02317 - Excavation and Backfill for Utilities.

B. Replace pavement or sidewalks removed or damaged by excavation in accordance with Section 02951 - Pavement Repair and Resurfacing. In unpaved areas, bring surface to grade and slope surrounding excavation. Replace minimum of 4 inches of topsoil and seed according to requirements of Section 02921 - Hydro-mulch Seeding.

END OF SECTION

SECTION 02621

GEOTEXTILE

PART 1 GENERAL

.01 SECTION INCLUDES

A. Geotextile, also called filter fabric, in applications including pipe embedment wrap, around exterior of tunnel liner, around foundations of pipeline structures, and slope stabilization.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for Work performed under this Section. Include cost of Work in unit prices for Work requiring geotextile.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. AASHTO M 288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

C. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles (Grab Method).

E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of Geotextiles.

F. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit standard manufacturer's catalog sheets and other pertinent information, for approval, prior to installation.

C. Submit installation methods, as part of Work plan for tunneling or for excavation and backfill for utilities. Obtain approval from Project Manager for filter fabric material and proposed installation method prior to use of filter fabric.

PART 2 PRODUCTS

.01 GEOTEXTILE

A. Provide geotextile (filter fabric) designed for use in geotechnical applications. Filter fabric shall provide permeable layer or media while retaining soil matrix.

B. Use fabric which meets physical requirements for Class A subsurface drainage installation conditions as defined in AASHTO M 288 and as specified in Paragraph 2.02, Properties.

.02 PROPERTIES

A. Material: Nonwoven, nonbiodegradable, fabric consisting of continuous chain polymer filaments or yarns, at least 85 percent by weight polyolefins, polyesters or polyamide, formed into dimensionally stable network.

B. Chemical Resistance: Inert to commonly encountered chemicals and hydrocarbons over pH range of 3 to 12.

C. Physical Resistance: Resistant to mildew and rot, ultraviolet light exposure, insects and rodents.

D. Minimum Test Values:

Property	**Value (Min)**	**Test Method**
Grab Strength	180 lbs.	ASTM D 4632
Trapezoidal tear Strength	50 lbs.	ASTM D 4533
Puncture Strength	80 lbs.	ASTM D 4833
Mullen Burst Strength	290 psi.	ASTM D 3786
Apparent Opening Size [1]	0.25 mm	ASTM D 4751
Permittivity (sec^{-1})	0.2	ASTM D 4491
[1] Maximum average roll value.		

PART 3 EXECUTION

.01 LINE WORK

A. Conform use of geotextile to backfill for utilities to Section 02317 - Excavation and Backfill for Utilities.

.02 TUNNEL WORK

A. Use geotextile outside of tunnel primary liner to prevent migration of soil fines into excavated tunnel resulting in voids or settlement. Select geotextile, subject to minimum requirements of Paragraph 2.02, meeting tunnel liner design requirements and installation conditions.

END OF SECTION

SECTION 02711

HOT MIX ASPHALT BASE COURSE

PART 1 GENERAL

.01 SECTION INCLUDES

A. Foundation course of compacted mixture of coarse and fine aggregates, and asphalt binder.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for hot mix asphalt base is on a per ton basis.
2. Payment for hot mix asphalt base for transitions and base repairs is on a per ton basis.
3. Payment for hot mix asphaltic base for temporary driveway, roadway shoulders, etc., is on a per ton basis.
4. Measurement for utility projects:
    a. Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings.
    b. Include installed hot mix asphalt base course material that extends one foot beyond outside edge of pavement to be replaced, except where proposed pavement section shares common edge with existing pavement section.
5. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. AASHTO T201 - Standard Specification for Kinematic Viscosity of Asphalts (Bitumens).

B. AASHTO T202 - Standard Specification for Viscosity of Asphalt by Vacuum Capillary Viscometer.

C. ASTM C 33 - Standard Specifications for Concrete Aggregate.

D. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

E. ASTM C 136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

F. ASTM D 4402 - Standard Test Method for Viscosity Determination of unfilled Asphalt Using the Broolfield Thermal Apparatus.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certificates that asphalt materials and aggregates meet requirements of Paragraph 2.01, Materials.

C. Submit proposed mix and test data for each type of base course in Work.

D. Submit manufacturer's description and characteristics of mixing plant for approval.

E. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

PART 2 PRODUCTS

.01 MATERIALS

A. Coarse Aggregate:

1. Use crushed gravel or crushed stone, or combination retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic, or other injurious material occurring either free or as coating on aggregate. Conform aggregate o ASTM C 33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed 40 percent by weight when tested in accordance with ASTM C 131.

2. Reclaimed asphalt pavement (RAP) or reclaimed Portland cement concrete pavement (RPCCP) are permitted as aggregates for hot mix asphalt base course if combined aggregate criteria, gradation, and mixture properties are met.

B. Fine Aggregate: Sand or stone screenings, or combination thereof, passing No. 10 sieve. Conform aggregate to ASTM C 33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other deleterious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than 6 when tested. Sand equivalent shall have minimum value of 45 when tested.

C. Composite Aggregate: Conform to following limits when graded in accordance with ASTM C 136. Provide either coarse or fme aggregate where designated on the Drawings.

GRADATION OF COMPOSITE AGGREGATE **Percent Passing by Weight or Volume**		
Sieve Size	Type A Coarse Base	Type B Fine Base
1 ½”	100	-
1 ¼”	95 to 100	-
1”	-	100
7/8”	70 to 90	95 to 100
5/8”	-	75 to 95
½”	50 to 70	
3/8”	-	60 to 80
#4	30 to 50	40 to 60
#10	30 to 34	27 to 40
#40	5 to 20	10 to 25
#80	2 to 12	3 to 13
#200	1 to 6*	1 to 6*
VMA % Minimum	11	12
*2 to 8 when Washed Sieve Analysis is used.		

D. Asphalt Binder: Moisture-free homogeneous material meeting following requirements: [a.]

SPECIFICATION	PG 64 - 22
Average 7-day Maximum Pavement Design Temperastuer, degrees C [a.]	<64
Minimum Pavement Design Temperature, degrees C [a.]	>-22
Original Binder	
Flash Point Temperature, T48, Minimum degrees C	230
Viscosity, ASTM D 4402, [b.] Maximum 3 Pa.s (3000cP), Test Temperature, degrees C	135
Dynamic Shear, TP5; [c.] G*/sine[], Minimum, 1.00kPa Test Temperture @ 10 rad/sec, degrees C	64
Rolling Thin Film Oven (T240) or Thin Film Oven (T179) Residue	
Mass Loss, Maximum, %	-1.00
Dynamic Shear, TP5; G*/sine[], Minimum, 2.20 kPa Test Temperature @ 10rad/sec, degrees C	64
Pressure Aging Vessel Residue (PPI)	
PAV Aging Tempersture, degrees C [d.]	100
Dynamic Shear, TP5;G*/sine[], Maximum, 5000kPa Test Temperature @ 10rad/sec, degrees C	25
Physical Hardening [e.]	Report
Creep Stiffness, TP1; [f.] S, Maximum, 300 Mpa; m-value,. Minimum, 0.300 Test Temperature @ 60sec, degrees C	-12
Direct Tension, TP3; [f.] Failure Strain, Minimum, 1.0%; Test Temperature @ 1.0 mm/min,degrees C	-12

Notes:

a. Pavement temperature can be estimated from air temperatures using algorithm contained in testing procedures.
b. The requirement may be waived at discretion of Project Manager if supplier warrants that asphalt binder can be adequately pumped and mixed at temperatures that meet applicable safety standards.
c. For quality control of unmodified asphalt cement production, measurement of viscosity of original asphalt cement may be substituted for dynamic shear measurements of G*/sine [ ] at test temperature where asphalt is Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary of rotational viscometry (AASHTO T 201 or T202).
d. The PAV aging temperature is based on simulated climatic conditions and is one of three temperatures: 90 C, 100 C, or 110 C. The PAV aging temperature is 100 C for PG64 and PG70.
e. Physical Hardening - TP I is performed on a set of asphalt beams according to Section 13.1, except conditioning time is extended to 24 hours plus of minus 10 minutes at 10 C above minimum performance temperature. The 24-hour stiffness and m-value are reported for information purposes only.
f. If creep stiffness is below 300 MPa, the direct tension test is not required. If creep stiffness is between 300 and 600 MPa the direct tension failure strain requirement can be used in lieu of creep stiffness requirement. The m-value requirement must be satisfied in both cases.

E. Reclaimed asphalt pavement (RAP) may be used at a rate no greater than 20 percent.

.02 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception of a drum mix plant, the plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins, and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:

1. Cold aggregate bins and proportioning device
2. Dryer
3. Screens
4. Aggregate weight box and batching scales
5. Mixer
6. Asphalt storage and heating devices
7. Asphalt measuring devices
8. Truck scales

C. Bins: Separate aggregate into minimum of four bins to produce consistently uniform grading and asphalt content in completed mix. One cold feet bin per stockpile is required.

.03 MIXES

A. Employ certified testing laboratory to prepare design mixes.

1. Verify mixture design properties for plant-produced mixture. Demonstrate that asphalt plant is capable of producing mixture meeting design volumetric and stability requirements before placement begins.

B. Density, Stability, and Air Voids Requirements. Select asphalt binder content for base courses to result in 3 to 5 percent air voids in laboratory molded specimens, while meeting minimum VMA requirement for selected mixture classification.

Percent Density		Percent	HVEEM Stability Percent	Percent Asphalt Content	
Min	Max	Optimum	Not Less Than	Min.	Max.
94.5	97.5	96	35	3.5	7

PART 3 EXECUTION

.01 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Verify lines and grades are correct.

C. Prepare subgrade in accordance with requirements of Section 02315 - Roadway Excavation. Subgrade preparation may also refer to Section 02321 - Cement Stabilized Sand.

D. Correct subgrade deviations in excess of plus or minus 1/4 inch in cross section, or in 16 foot length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

.02 PLACEMENT

A. Place base when surface temperature taken in shade and away from artificial heat is above 40 degrees F and rising. Do not place asphalt base when temperature of surface to receive base course is below 50 degrees F and falling.

B. Haul prepared and heated asphalt base mixture to project in tight vehicles previously cleaned of foreign material. Mixture shall be at temperature between 250 degrees F and 325 degrees F when laid.

C. Place hot mix asphalt base course in compacted lifts no greater than 4 inches thick, unless permitted in writing by Engineer.

D. Place courses as nearly continuously as possible. Place material with approved mechanical spreading and finishing machine of screeding or tamping type. Spread lifts to attain smooth course of uniform density to section, line, and grades as indicated on Drawings.

E. In areas with limited space where use of paver or front-end loader is impractical, spread by hand and compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix; do not broadcast material. Remove lumps that do not break down readily.

.03 JOINTS

A. Transverse Joints. Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back placed material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

B. Existing pavement. When new asphalt is laid against existing asphalt pavement, saw cut existing asphalt to full depth creating vertical face. Clean joint and apply tack coat before placement.

.04 COMPACTION

A. Construct test strip to identify correct type, number, and sequence of rollers necessary to obtain specified in-place density or air-voids. Prepare test strip at least 500 feet in length, comparable to placement and compaction conditions for Project.

B. Begin rolling while pavement is still hot and as soon as it will bear roller without undue displacement or hair line cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water; do not use petroleum by-products.

C. Compact surface thoroughly and uniformly with power-driven equipment capable of obtaining required compaction. Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling before mat temperature drops below 175 degrees F.

D. Along walls, curbs, headers, similar structures, and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

E. Compact base course to a minimum density of 91 percent.

.05 TOLERANCES

A. Pavement Repairs.

1. Furnish templates for checking surface of finished sections. Maximum deflection of templates, when supported at center, shall not exceed 1/4 inch.

2. Completed surface, when tested with 10 foot straight edge laid parallel to center line of pavement, shall show no deviation in excess of 1/4 inch in 10 feet. Correct surface not meeting this requirement.

.06 FIELD QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, the AW Project Manager may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. For in-place depth and density, take minimum of one core at random locations for each 1000 feet of single lane pavement. On a 2-lane pavement, take samples

at random every 500 feet from alternating lanes. Take cores for parking lots every 500 square yards of base to determine in-place depth and density. If cul-de sac or streets are less than 500 feet, minimum of 2 cores (one per lane) will be procured. On small projects, take a minimum of two cores for each day's placement. For first days placement and prior to coring, minimum of 5 nuclear gauge readings will be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This process will continue for each day's placement until engineer determines that a good bias has been established for that nuclear gauge.

C. Determine in-place density from cores or sections of asphaltic base located near each core. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by AW Project Manager.

D. Request, at option, three additional cores within a 5-foot radius of core indicating nonconforming in-place depth at no additional cost to AW. In-place depth at these locations shall be average depth of four cores.

E. Fill cores and density test sections with new compacted asphalt base or cold patch material.

.07 NONCONFORMING PAVEMENT

A. Re-compact and retest nonconforming street sections not meeting surface test requirements. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute. Retesting is at no cost to the AW.

B. Remove and replace areas of asphalt base found deficient in thickness by more than 10 percent. Remove and replace areas of asphalt base found deficient in density. Use new asphalt base of thickness shown on Drawings.

C. Replace or correct nonconforming pavement sections at no additional cost to AW.

.08 PROTECTION

A. Do not open base to traffic until 12 hours after completion of rolling, or as shown on Drawings.

B. Maintain asphalt base in good condition until completion of Work.

C. Repair defects immediately by replacing base to full depth.

END OF SECTION

SECTION 02712

CEMENT STABILIZED BASE COURSE

PART 1 GENERAL

.01 SECTION INCLUDES

A. Foundation course of cement stabilized crushed stone.

B. Foundation course of cement stabilized bank run gravel.

.02 MEASUREMENT AND PAYMENT

1. Payment for cement stabilized base course is on square yard basis. Separate pay items are used for each different required thickness of base course.
2. Payment for asphaltic seal cure is by gallon.
3. Refer to Measurement and Payment for unit price procedures.
4. Refer to Paragraph 3.09, Unit Price Adjustment.

C. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in Los Angeles Machine.

B. ASTM C 150 - Standard Specification for Portland Cement.

C. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft3 (600kN kN-m/m3).

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

E. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit samples of crushed stone, gravel, and soil binder for testing.

C. Submit manufacturer's description and characteristics for pug mill and associated equipment, spreading machine, and compaction equipment for approval.

.05 TESTS

A. Perform testing under provisions of Testing Laboratory Services.

B. Perform tests and analysis of aggregate and binder materials in accordance with ASTM D 1557 and ASTM D 4318.

.06 DELIVERY, STORAGE AND HANDLING

A. Make stockpiles from layers of processed aggregate to eliminate segregation of materials. Load material by making successive vertical cuts through entire depth of stockpile.

B. Store cement in weatherproof enclosures. Protect from ground dampness.

PART2 PRODUCTS

.01 CEMENT

A. ASTM C 150 Type I; bulk or sacked.

.02 WATER

A. Clean, clear; and free from oil, acids, alkali, or vegetable matter.

.03 AGGREGATE

A. Crushed Stone: Material retained on No. 40 Sieve meeting following requirements:

1. Durable particles of crusher-run broken limestone, sandstone, or granite obtained from approved source.
2. Los Angeles abrasion test percent of wear not to exceed 40 when tested in accordance with ASTM C 131.

B. Gravel: Durable particles of bank run gravel or processed material.

C. Soil Binder: Material passing No. 40 Sieve meeting following requirements when tested in accordance with ASTM D 4318:

1. Maximum Liquid limit: 35.
2. Maximum Plasticity index: 10.

D. Mixed aggregate and soil binder shall meet the following requirements:

1. Grading in accordance within the following limits:

Sieve	Percent Retained			
	Crushed Stone	Processed G.1	Gravel G2	Bank run Gravel
1 ¾ inch	0 to 10	0 to 5	-	0 to 5
½ inch	-	-	0	-
No.4	45 to 75	30 to 75	15 to 35	30 to 75
No.40	55 to 80	60 to 85	55 to 85	65 to 85

2. Obtain prior permission from AW Project Manager for use of additives to meet above requirements.

.04 ASPHALT SEAL CURE

A. Cutback Asphalt: MC30

B. Emulsified Petroleum Resin: EPR-1 Prime

.05 MATERIAL MIX

A. Design mix for minimum average compressive strength of 200 psi at 48 hours. Provide minimum cement content of 1 1/2 sacks, weighing 94 pounds each, per ton of mix.

B. Increase cement content when average compressive strength of tests on field samples fall below 200 psi. Refer to Part 3 concerning field samples and tests.

C. Mix in stationary pug mill equipped with feeding and metering devices for adding specified quantities of base material, cement, and water into mixer. Dry mix base material and cement sufficiently to prevent cement balls from forming when water is added.

D. Resulting mixture shall be homogeneous and uniform in appearance.

.06 SOURCE QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, the AW Project Manager may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. Perform testing for unconfined compressive strength as follows:

1. Mold three samples each day or for each 300 tons of production.

2. Compressive strength shall be average of three tests for each production lot.

PART 3 EXECUTION

.01 EXAMINATION

A. Verify compacted subgrade is ready to support imposed loads.

B. Verify lines and grades are correct.

.02 PREPARATION

A. Complete backfill of new utilities below future grade.

B. Prepare subgrade in accordance with requirements of Section 02315 - Roadway Excavation.

C. Correct subgrade deviations in excess of plus or minus 1/4 inch in cross section or in 16 foot length by loosening, adding or removing material, reshaping and recompacting by sprinkling and rolling.

D. Prepare sufficient subgrade in advance of base course for efficient operations.

.03 PLACEMENT

A. Do not mix and place cement stabilized base when temperature is below 40 degrees F and falling. Place base when temperature taken in shade and away from artificial heat is above 35 degrees F and rising.

B. Place material on prepared subgrade in uniform layers to produce thickness indicated on Drawings. Depth of layers shall not exceed 6 inches.

C. Spread with approved spreading machine. Conduct spreading so as to eliminate planes of weakness or pockets of non-uniformly graded material resulting from hauling and dumping operations.

D. Provide construction joints between new material and stabilized base that has been in place 4 hours or longer. Joints shall be approximately vertical. Form joint with temporary header or make vertical cut of previous base immediately before placing subsequent base.

E. Use only one longitudinal joint at center line under main lanes and shoulder unless shown otherwise on Drawings. Do not use longitudinal joints under frontage roads and ramps unless indicated on Drawings.

F. Place base so that projecting reinforcing steel from curbs remain at approximate center of base. Secure firm bond between reinforcement and base.

.04 COMPACTION

A. Start compaction as soon as possible but not more than 60 minutes from start of moist mixing. Compact loose mixture with approved tamping rollers until entire depth is uniformly compacted. Do not allow stabilized base to mix with underlying material.

B. Correct irregularities or weak spots immediately by replacing material and recompacting.

C. Apply water to maintain moisture between optimum and 2 percent above optimum moisture as determined by ASTM D 698. Mix in with spiked tooth harrow or equal. Reshape surface and lightly scarify to loosen imprints made by equipment.

D. Remove and reconstruct sections where average moisture content exceeds ranges specified at time of final compaction.

E. Finish by blading surface to final grade after compacting final course. Seal with approved pneumatic tired rollers which are sufficiently light to prevent surface hair line cracking. Rework and recompact at areas where hair line cracking develops.

F. Compact to minimum density of 95 percent of maximum dry density at moisture content of treated material between optimum and 2 percent above optimum as determined by ASTM D 1557, unless otherwise indicated on Drawings.

G. Maintain surface to required lines and grades throughout operation.

.05 CURING

A. Moist cure for minimum of 7 days before adding pavement courses. Restrict traffic on base to local property access. Keep subgrade surface damp by sprinkling.

B. If indicated on Drawings, cover base surface with curing membrane as soon as finishing operation is complete. Apply with approved self-propelled pressure distributor at following rates, or as indicated on Drawings:

1. MC30: 0.1 gallon per square yard.
2. EPR-1 Prime: 0.15 gallon per square yard.

C. Do not use cutback asphalt during period of April 16 to September 15

.06 TOLERANCES

A. Smooth and conform completed surface to typical section and established lines and grades.

B. Top surface of base course: Plus or minus 1 1/4 inch in cross section, or in 16 foot length.

.07 FIELD QUALITY CONTROL

A. Take minimum of one core at random locations per 1000 linear feet per lane of roadway or 500 square yards of base to determine in-place depth.

B. Request additional cores in vicinity of cores indicating nonconforming in-place depths at no extra cost to AW. When average of tests fall below required depth, place additional material and compact at no additional cost to AW.

C. Perform compaction testing in accordance with ASTM D 698 or ASTM D 2922 and ASTM D 3017 at randomly selected locations. Remove and replace areas that do not conform to compaction requirements at no additional cost to AW.

D. Fill cores and density test sections with new compacted cement stabilized base.

.08 NON CONFORMING BASE COURSE

A. Remove and replace areas of base course found deficient in thickness by more than 10 percent, or that fail compressive strength tests, with cement-stabilized base of thickness shown on Drawings.

B. Replace nonconforming base course sections at no additional cost to AW.

.09 UNIT PRICE ADJUSTMENT

A. Make unit price adjustments for in-place depth determined by cores as follows:

1. Adjusted unit price shall be ratio of average thickness as determined by cores to thickness bid upon, times unit price.

2. Apply adjustment to lower limit of 90 percent and upper limit of 100 percent of unit price.

.010 PROTECTION

A. Maintain stabilized base in good condition until completion of Work. Repair defects immediately by replacing base to full depth.

B. Protect asphalt membrane, when used, from being picked up by traffic. Membrane may remain in place when proposed surface courses or other base courses are to be applied.

END OF SECTION

SECTION 02741

ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

.01 SECTION INCLUDES

A. Surface course of compacted mixture of coarse and fine aggregates and asphaltic binder.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for hot-mix asphalt concrete pavement is on a per ton basis. Separate pay items are used for each different required thickness of pavement.
2. Payment for hot-mix asphalt concrete pavement includes payment for associated work performed.
3. Measurement for utility projects: Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings.
4. Payment for temporary detour pavement is on a square yard basis and includes surface and base materials, associated grading, maintenance and removal as well as restoration of ditches .
5. Payment for speed bumps is on linear foot basis, and includes milling of existing pavement, tack coat, and placement and compaction of asphalt. Measurement of speed bump is along length of 12 foot wide speed hump, measured transverse to centerline of road. Separate payment is made for thermoplastic markings applied to speed bump.
6. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM C 33 - Standard Specification for Concrete Aggregates.

B. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certificates that asphalt materials and aggregates meet requirements of

Paragraph 2.01, Materials.

C. Submit proposed design mix and test data for surface course.

D. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

PART 2 PRODUCTS

.01 MATERIALS

A. Coarse Aggregate:

1. Use gravel, crushed stone, or combination thereof, that is retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic or other injurious matter occurring either free or as coating on aggregate. Use aggregate conforming to ASTM C 33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed 40 percent by weight when tested in accordance with ASTM C 131.

2. Aggregate by weight shall not contain more than 1.0 percent by weight of fine dust, clay-like particles, or silt.

B. Fine Aggregate: Sand, stone screenings or combination of both passing No. 10 sieve. Use aggregate conforming to ASTM C 33 except for gradation. Use sand composed of sound, durable stone particles free from foams or other injurious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than 6. Sand equivalent shall have minimum value of 45.

C. Composite Aggregate: Conform to following limits. Use type specified on Drawings:

GRADATION OF COMPOSITE AGGREGATE		
	PERCENT PASSING	
SIEVE SIZE	Course Surface (Type C)	Fine Surface (Type D)
7/8"	100	---
5/8"	95 to 100	
1/2"	--	100
3/8"	70 to 85	85 to 100
# 4	43 to 63	50 to70
#10	30 to 40	32 to 42
#40	10 to 25	11 to 26
#80	3 to 13	4 to 14
#200	*1 to 6**	1 to *6**
VMA % minimum	13	*14*
* *2* to 8 when Washed Sieve Analysis is used.		

D. Asphalt Binder: Moisture-free homogeneous material which will not foam when heated to 347 F, meeting the following requirements.

PERFORMANCE GRADED BINDER	
CRITERIA I TEST	PERFORMANCE GRADE (PG64-22)
Average 7-day Maximum Pavement Design Temperature, C	< 64
Minimum Pavement Design Temperature, C	> -22
ORIGINAL BINDER	
Flash Point Temperature, T48; Minimum C	230
Viscosity, ASTM D 4402; Maximum, 3Pa*s (3000 cP) Test Temperature, C	135
Dynamic Shear, TP5; G*/sin[ ], Minimum, 1.00 kPa Test Temperature @ 10 rad/sec., C	64
ROLLING THIN FILM OVEN (T240) OR THIN FILM OVEN (T179) RESIDUE	
Mass Loss, Maximum , %	1.00
Dynamic Shear, TP5; G*/sin [ ], Minimum, 2.20 kPa Test Temperature @ 10 rad/sec., C	64
PRESSURE AGING VESSEL RESIDUE (PP1)	
PAV Aging Temperature, C	100
Dynamic Shear, TP5; G*/sin [ ], Minimum, 5000 kPa Test Temperature @ 10 rad/sec., C	25
Physical hardening	Report
Creep Stiffness, TP1; S, Maximum, 300 Mpa -value, Minimum, 0.300 Test Temperature @ 60 sec., C	-12
Direct Tension, TP3; Failure Strain, Minimum, 1.0% Test Temperature @ 1.0 mm/min, C	-12

E. Anti-stripping Agent:

1. Evaluate mixture of aggregate, asphalt, and additives proposed for use for moisture susceptibility and requirement for anti-stripping agents. To substantiate mix design, produce and test trial mixtures using proposed project materials and equipment prior to placement. Test for susceptibility to moisture and trial mixture may be waived by Project Manager when similar designs using same material have previously proven satisfactory.
2. Liquid Anti-stripping Agent. Use anti-stripping agent with uniform liquid with

no evidence of crystallization, settling, or separation of components. Submit sample of anti-stripping agent proposed for use and manufacturer's product data, including recommended dosage range, handling and storage, and application instructions.

F. Pavement markings for speed bumps: Provide ‘Thermoplastic Pavement Markings’ to match existing or a type as approved by the Project Manager.

.02 EQUIPMENT

A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuous mixtures meeting specifications. With exception of a drum mix plant, plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins, and dust collectors.

B. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:

1. Cold aggregate bins and proportioning device
2. Dryer
3. Screens
4. Aggregate weight box and hatching scales
5. Mixer
6. Asphalt storage and heating devices
7. Asphalt measuring devices
8. Truck scales

C. Bins: Separate aggregate into minimum of four bins to produce consistently uniform grading and asphalt content in completed mix. Provide one cold feed bin per stockpile.

.03 MIXES

A. Employ certified testing laboratory to prepare design mixes.

B. Density, Stability and Air Void Requirements:

Percent Density		Percent	HVEEM Stability Percent
Min	Max	Optimum	Not Less Than
94.5	97.5	96	35

PART 3 EXECUTION

.01 EXAMINATION

A. Verify compacted base course is ready to support imposed loads.

B. Verify lines and grades are correct.

.02 PREPARATION

A. Where mixture will adhere to surface on which it is to be placed without use of tack coat, tack coat may be eliminated when approved by Project Manager.

B. Prepare subgrade in accordance with requirements of Section 02711 - Hot Mix Asphalt Base Course, Section 02712 - Cement Stabilized Base Course.

C. Prepare subgrade in advance of asphalt concrete paving operation.

D. Perform pavement repair and resurfacing as indicated in Section 02951 - Pavement Repair and Resurfacing.

E. Do not use cutback asphalt.

F. Milling of pavement for speed humps: Mill pavement (concrete or asphalt) to depth of one inch and width between 18 and 24 inches around entire perimeter of proposed hump, as shown in detail for speed hump design.

.03 PLACEMENT

A. Do not place asphalt pavement less than 2 inches thick when surface temperature taken in shade and away from artificial heat is below 50 degrees F and falling. Asphalt may be placed when temperature is above 40 degrees F and rising.

B. Haul prepared and heated asphaltic concrete mixture to project in tight vehicles previously cleaned of foreign material. Mixture temperature shall be between 250 degrees F and 325 egrees F when laid.

C. Spread material into place with approved mechanical spreading and finishing machine of screening or tamping type.

D. Surface Course Material: Surface course 2 inches or less in thickness may be spread in one lift. Spread lifts in such a manner that, when compacted, finished course will be smooth, of uniform density, and will be to section, line and grade as shown. Place construction joints on surface courses to coincide with lane lines or as directed by Project Manager.

E. Joints: Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back laid material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.

F. When new asphalt is laid against existing or old asphalt, saw cut existing or old asphalt to full depth to provide straight smooth joint.

G. In smaller restricted areas where use of paver is impractical spread material by hand. Compact asphalt by mechanical means. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove lumps that do not break down readily.

.04 COMPACTION

A. Construct test strip to identify correct type, number, and sequence of rollers necessary to obtain specified in-place density or air-voids when directed by the Project Manager. Prepare test strip at least 1,000 feet in length, comparable to placement and compaction conditions for Project.

B. Begin rolling while pavement is still hot and as soon as it will bear roller without shoving, displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water or petroleum by-products.

C. Compact surface thoroughly and uniformly, first with power-driven, 3-wheel, or tandem rollers weighing a minimum of 8 tons. Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling before mat temperature drops below 185 degrees F.

D. Use tandem roller for final rolling. Double coverage with approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.

E. Along walls, curbs, headers and similar structures, and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.

F. Compact binder course and surface course to a minimum density of 91 percent of maximum possible density of void less mixture composed of same materials in like proportions.

.05 TOLERANCES

A. Furnish templates for checking surface in finished sections. Maximum deflection of templates, when supported at center, shall not exceed 118 inch.

B. Completed surface, when tested with 10 foot straightedge laid parallel to center line of pavement, shall show no deviation in excess of 118 inch in 10 feet. Correct surface not meeting this requirement.

C. Dimensions of speed humps shall conform to details for speed hump design and speed hump height tolerances.

.06 QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing

Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, the AW Project Manager may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. For in-place depth and density, take minimum of one core at random locations for each 1000 feet of single lane pavement. On a 2-lane pavement, take samples at random every 500 feet from alternating lanes. Take cores for parking lots every 500 square yards of base to determine in-place depth and density. If cul-de sac or streets are less than 500 feet, minimum of 2 cores (one per lane) will be procured. On small projects, take a minimum of two cores for each day's placement. For first days placement and prior to coring, minimum of 5 nuclear gauge readings will be performed at each core location to establish correlation between nuclear gauge (wet density reading) and core (bulk density). This process will continue for each day's placement until engineer determines that a good bias has been established for that nuclear gauge.

C. Determine in-place density from cores or sections. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by Project Manager. Average densities for each street placed in a single day to determine compliance.

END OF SECTION

SECTION 02751

CONCRETE PAVING

PART 1 G E N E R A L

.01 SECTION INCLUDES

A. Portland cement concrete paving.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete paving is on square yard basis. Separate pay items are used for each different required thickness of pavement.
2. Payment for concrete paving, high early strength, is on square yard basis.
3. Measurement for utility projects: Match actual pavement replaced but no greater than maximum pavement replacement limits shown on Drawings.
4. Refer to Measurement and Payment for unit price procedures.
5. Refer to Paragraph 3.15, Unit Price Adjustment.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

B. ASTM A 185 - Standard Specifications for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

C. ASTM A 615 - Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.

D. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

E. ASTM C 33 - Standard Specifications for Concrete Aggregates. 02751-1

F. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

G. ASTM C 40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

H. ASTM C 42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

I. ASTM C 78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third Point Loading).

J. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

K. ASTM C 131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

L. ASTM C 136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.

M. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

N. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

O. ASTM C 150 - Standard Specification for Portland Cement.

P. ASTM C 174 - Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores.

Q. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

R. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

S. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

T. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures

B. Submit proposed mix design and test data for each type and strength of concrete in Work. Include proportions and actual flexural strength obtained from design mixes at required test ages.

C. Submit for approval manufacturer's description and characteristics for mixing equipment, and for traveling form paver, when proposed for use.

D. Submit manufacturer's certificates giving properties of reinforcing steel. Include certificate of compliance with ASTM A 82. Provide specimens for testing when required by AW Project Manager.

.05 HANDLING AND STORAGE

A. Do not mix different classes of aggregate without written permission of AW Project Manager.

B. Class of aggregate being used may be changed before or during Work with written permission of Project Manager. Comply new class with specifications.

C. Reject segregated aggregate. Before using aggregate whose particles are

separated by size, mix them uniformly to grading requirements.

D. Reject aggregates mixed with dirt, weeds, or foreign matter.

E. Do not dump or store aggregate in roadbed.

PART 2 PRODUCTS

.01 MATERIALS

A. Portland Cement:

1. Sample and test cement to verify compliance with Standards of ASTM C 150, Type I or Type III.
2. Bulk cement which meets referenced standards may be used when method of handling is approved by AW Project Manager. When using bulk cement, provide satisfactory weighing devices.
3. Fly ash which meets standards of ASTM C 618 may be used as mineral fill when method of handling is approved by AW Project Manager.

B. Water: Conform to requirements for water in ASTM C 94.

C. Coarse Aggregate: Crushed stone, gravel, or combination thereof, which is clean, hard, and durable, conforms to requirements of ASTM C 33, and has abrasion loss not more than 45 percent by weight when subjected to Los Angeles Abrasion Test (ASTM C 131).

1. Maximum percentage by weight of deleterious substances shall not exceed following values:

Item	Percent by Weight of Total Sample Maximum
Clay lumps and friable particles	3.0
Material finer than 75-µm (No. 200) sieve:	
Concrete subject to abrasion	3.0*
All Other concrete	5.0*
Coal and lignite:	
Where surface appearance of concrete is of importance	0.5
All other concrete	1.0

* In case of manufactured sand, when material finer than 75-µm (No. 200) sieve consists of dust of fracture, essentially free from clay or shale, these limits may be increased to 5 and 7 percent, respectively.

2. Conform coarse aggregate (size 1 1/2 inch to No. 4 sieve) to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 1 3/4" sieve	0
Retained on 1 1/2"sieve	0 to 5
Retained on 3/4" sieve	30 to 65
Retained on 3/8" sieve	70 to 90
Retained on No. 4 sieve	95 to 100
Loss by Decantation Test	1.0 maximum

* In case of aggregates made primarily from crushing of stone, when material finer than 200 sieve is dust of fracture essentially free from clay or shale, percent may be increased to 1.5.

D. Fine Aggregate: Sand, manufactured sand, or combination thereof, composed of clean, hard, durable, uncoated grains, free from loams or other injurious foreign matter. Conform fine aggregate for concrete to requirements of ASTM C 33. Use gradation within following limits when graded in accordance with ASTM C 136:

Sieve Designation (Square Openings)	Percentage by Weight
Retained on 3/8" sieve	0
Retained on No. 4 sieve	0 to 5
Retained on No. 8 sieve	0 to 20
Retained on No. 16 sieve	15 to 50
Retained on No. 30 sieve	35 to 75
Retained on No. 50 sieve	65 to 90
Retained on No. 100 sieve	90 to 100
Retained on No. 200 sieve	97 to 100

1. When subjected to color test for organic impurities (ASTM C 40), fine aggregate shall not show color darker than standard color. Sand equivalent value shall not be less than 80, unless higher value is shown on Drawings.

E. Mineral Filler: Type "C" or Type "F" fly ash of acceptable quality and meeting requirements of ASTM C 618 may be used as mineral admixture in concrete mixture. When fly ash mineral filler is used, store and inspect in accordance with ASTM C 618. Do not use fly ash in amounts to exceed 25 percent by weight of cementatious material in mix design. Cement content may be reduced when strength requirements can be met. Note: When fly ash is used, term "cement" is defined as cement plus fly ash.

F. Air Entraining Agent: Furnish air entraining agent conforming to requirements of ASTM C 260.

G. Water Reducer: Water reducing admixture conforming to requirements of ASTM C 494 may be used when required to improve workability of concrete. Amount and type of admixture is subject to approval by Project Manager.

H. Reinforcing Steel:

1. Provide new billet steel manufactured by open hearth process and conforming to ASTM A 615, Grade 60. Store steel to protect it from mechanical injury and rust. At time of placement, steel shall be free from dirt, scale, rust, paint, oil, or other injurious materials.

2. Cold bend reinforcing steel to shapes shown. Once steel has been bent, it may not be re-bent.

3. Provide wire fabric conforming to ASTM A 82. Use fabric in which longitudinal and transverse wires have been electrically welded at points of intersection. Welds shall have sufficient strength not to be broken during handling or placing. Conform welding and fabrication of fabric sheets to ASTM A 185.

.02 EQUIPMENT

A. Conform Equipment to requirements of ASTM C 94.

.03 MIXING

A. Flexural strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C78 (using simple beam with third-point loading). Compressive strength shall be as specified using test specimens prepared in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Determine and measure batch quantity of each ingredient, including water for batch designs and all concrete produced for Work. Mix shall conform to these specifications and other requirements indicated on Drawings.

B. Mix design to produce concrete which will have flexural strength of 500 psi at 7 days and 600 psi at 28 days. Slump of concrete shall be at least 2 inches but no more than 5 inches, when tested in accordance with ASTM C 143.

1. Concrete pavement, including curb, curb and gutter, and saw-tooth curb, shall contain at least 5 1/2 sacks (94 pounds per sack) of cement per cubic yard, with not more than 6.5 gallons of water, net, per sack of cement (water-cement ratio maximum 0.57). Determine cement content in accordance with ASTM C 138. Addition of mineral filler may be used to improve workability or plasticity of concrete to limits specified.

2. Coarse dry aggregate shall not exceed 85 percent of loose volume of concrete.

3. Add air-entraining admixture to ensure uniform distribution of agent throughout batch. Base air content of freshly mixed air-entrained concrete upon trial mixes with materials to be used in Work, adjusted to produce concrete of required plasticity and workability. Percentage of air entrainment in mix shall be 4 1/2 percent plus or minus 1 1/2 percent. Determine air content by testing in accordance with ASTM C 231.

4. Use retardant when temperature exceeds 90 degrees F. Proportion as

recommended by manufacturer. Use same brand as used for air-entraining agent. Add and batch material using same methods as used for air-entraining agent.

C. Use high early strength concrete pavement to limits shown on Drawings. Design to meet following:

1. Concrete Mix: Flexural strength greater than or equal to 500 psi at 72 hours.
2. Cement: Minimum of 7 sacks of cement per cubic yard of concrete.
3. Water-Cement Ratio maximum of 0.45. Slump of concrete shall a maximum of 5 inches, when tested in accordance with ASTM C 143.
4. Other requirements for proportioning, mixing, execution, testing, etc., shall be in accordance with this Section 02751 - Concrete Paving.

PART 3 EXECUTION

.01 EXAMINATION

A. Verify compacted base is ready to support imposed loads and meets compaction requirements.

B. Verify lines and grades are correct.

.02 PREPARATION

A. Properly prepare, shape and compact each section of sub grade before placing forms, reinforcing steel or concrete. After forms have been set to proper grade and alignment, use sub grade planer to shape sub grade to its final cross section. Check contour of sub grade with template.

B. Remove subgrade that will not support loaded form. Replace and compact subgrade to required density.

.03 EQUIPMENT

A. Alternate equipment and methods, other than those required by this Section, may be used provided equal or better results will be obtained. Maintain equipment for preparing subgrade and for finishing and compacting concrete in good working order.

B. Subgrade Planer and Template:

1. Use subgrade planer with adjustable cutting blades to trim sub grade to exact section shown on Drawings. Select planer mounted on visible rollers, which ride on forms. Planer frame must have sufficient weight so that it will remain on form, and have strength and rigidity that, under tests made by changing support from wheels to center, planer will not develop deflection of more than 1/8 inch. Tractors used to pull planer shall not produce ruts or indentations in subgrade. When slip form method of paving is used, operate sub grade

planer on prepared track grade or have it controlled by electronic sensor system operated from string line to establish horizontal alignment and elevation of sub base.

2. Provide template for checking contour of sub grade. Template shall be long enough to rest upon side forms and have strength and rigidity that, when supported at center, maximum deflection shall not exceed 1/8 inch. Fit template with accurately adjustable rods projecting downward at 1 foot intervals. Adjust these rods to gauge cross sections of slab bottom when template is resting on side forms.

C. Machine Finisher: Provide power-driven, transverse finishing machine designed and operated to strike off and consolidate concrete. Machine shall have two screeds accurately adjusted to crown of pavement and with frame equipped to ride on forms. Use finishing machine with rubber tires when it operates on concrete pavement.

D. Hand Finishing:

1. Provide mechanical strike and tamping template 2 feet longer than width of pavement to be finished. Shape template to pavement section.

2. Provide two bridges to ride on forms and span pavement for finishing expansion and dummy joints. Provide floats and necessary edging and finishing tools.

E. Burlap Drag or transverse broom for Finishing Slab: Furnish four plies of 10 ounce burlap material fastened to bridge to form continuous strip of burlap full width of pavement. Maintain contact 3 foot width of burlap material with pavement surface. Keep burlap drags clean and free of encrusted mortar.

F. Vibrators: Furnish mechanically operated, synchronized vibrators mounted on tamping bar which rides on forms and hand-manipulated mechanical vibrators. Furnish vibrators with frequency of vibration to provide maximum consolidation of concrete without segregation.

G. Traveling Form Paver: Approved traveling form paver may be used in lieu of construction methods employing forms, consolidating, finishing and floating equipment. Meet requirements of this specification for subgrade, pavement tolerances, pavement depth, alignments, consolidation, finishing and workmanship. When traveling form paver does not provide concrete paving that meets compaction, finish, and tolerance requirements of this Specification, immediately discontinue its use and use conventional methods.

1. Equip traveling paver with longitudinal trans angular finishing float adjustable to crown and grade. Use float long enough to extend across pavement to side forms or edge of slab.

2. Ensure that continuous deposit of concrete can be made at paver to minimize starting and stopping. Use conventional means of paving locations inaccessible to traveling paver, or having horizontal or vertical curvature that traveling paver cannot negotiate.

3. Where Drawings require tie bars for adjacent paving, securely tie and support bars to prevent displacement. Tie bars may be installed with approved mechanical bar inserter mounted on traveling-form paver. Replace pavement in which tie bars assume final position other than that shown on Drawings.

.04 FORMS

A. Side Forms: Use metal forms of approved shape and section. Preferred depth of form is equal to required edge thickness of pavement. Forms with depths greater or less than required edge thickness of pavement will be permitted, provided difference between form depth and edge thickness when not greater than 1 inch, and further provided that forms of depth less than pavement edge are brought to required edge thickness by securely attaching wood or metal strips to bottom of form, or by grouting under form. Bottom flange of form shall be same size as thickness of pavement. Aluminum forms are not allowed. Forms shall be approved by AW Project Manager. Length of form sections shall be not less than 10 feet and each section shall provide for staking in position with not less than 3 pins. Flexible or curved forms of wood or metal of proper radius shall be used for curves of 200 foot radius or less. Forms shall have ample strength and shall be provided with adequate devices for secure setting so that when in-place they will withstand, without visible springing or settlement, impact and vibration of finishing machine. In no case shall base width be less than 8 inches for form 8 inches or more in height. Forms shall be free from warp, bends or kinks and shall be sufficiently true to provide straight edge on concrete. Top of each form section, when tested with straight edge, shall conform to requirements specified for surface of completed pavement. Provide sufficient forms for satisfactory placement of concrete. For short radius curves, forms less than 10 feet in length or curved forms may be used. For curb returns at street intersections and driveways, wood forms of good grade and quality may be used.

B. Form Setting:

1. Rest forms directly on sub-grade. Do not shim with pebbles or dirt. Accurately set forms to required grade and alignment and, during entire operation of placing, compacting and finishing of concrete, do not deviate from this grade and alignment more than 1/8 inch in 10 feet of length. Do not remove forms for at least 8 hours after completion of finishing operations. Provide supply of forms that will be adequate for orderly and continuous placing of concrete. Set forms and check grade for at least 300 feet ahead of mixer or as approved by Project Manager.

2. Adjacent slabs may be used instead of forms, provided that concrete is well protected from possible damage by finishing equipment. Do not use adjacent slabs for forms until concrete has aged at least 7 days.

.05 REINFORCING STEEL AND JOINT ASSEMBLIES

A. Place reinforcing steel and joint assemblies and position securely as indicated on Drawings. Wire reinforcing bars securely together at intersections and splices.

Bars and coatings shall be free of rust, dirt or other foreign matter when concrete is placed. Secure reinforcing steel to chairs.

B. Position pavement joint assemblies at required locations and elevations, and rigidly secure in position. Install dowel bars in joint assemblies, each parallel to pavement surface and to centerline of pavement, as shown.

C. Cut header boards, joint filler, and other material used for forming joints to receive each dowel bar.

D. Secure in required position to prevent displacement during placing and finishing of concrete.

E. Drill dowels into existing pavement, secure with epoxy, and provide paving headers as required to provide rigid pavement sections.

F. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement requirements by more than 1 1/2 inches of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

.06 FIBROUS REINFORCING

A. Do not use fibrous reinforcing to replace structural, load-bearing, or moment-reinforcing steel.

.07 PLACEMENT

A. Place concrete when air temperature taken in shade and away from artificial heat is above 35 degrees F and rising. Do not place concrete when temperature is below 40 degrees F and falling.

B. Place concrete within 90 minutes after initial water had been added. Remove and dispose of concrete not placed within this period.

C. Concrete slump during placement shall be 1 to 5 inches, except when using traveling-form paver, slump shall be maximum of 2 inches.

D. Deposit concrete continuously in successive batches. Distribute concrete in manner that will require as little re-handling as possible. Where hand spreading is necessary, distribute concrete with shovels or by other approved methods. Use only concrete rakes in handling concrete. At placement interruption of more than 30 minutes, place transverse construction joint at stopping point. Remove and replace sections less than 10 feet long.

E. Take special care in placing and spading concrete against forms and at longitudinal and transverse joints to prevent honeycombing. Voids in edge of finished pavement will be cause for rejection.

.08 COMPACTION

A. Consolidate concrete using mechanical vibrators as specified herein. Extend vibratory unit across pavement, not quite touching side forms. Space individual vibrators at close enough intervals to vibrate and consolidate entire width of pavement uniformly. Mount mechanical vibrators to avoid contact with forms, reinforcement, transverse or longitudinal joints.

B. Furnish enough hand-manipulated mechanical vibrators for proper consolidation of concrete along forms, at joints and in areas not covered by mechanically controlled vibrators.

.09 FINISHING

A. Finish concrete pavement with power-driven transverse finishing machines or by hand finishing methods.

1. Hand finish with mechanical strike and tamping template in same width as pavement to be finished. Shape template to pavement section shown on Drawings. Move strike template forward in direction of placement, maintaining slight excess of material in front of cutting edge. Make minimum of two trips over each area. Screed pavement surface to required section. Work screed with combined transverse and longitudinal motion in direction work is progressing. Maintain screed in contact with forms. Use longitudinal float to level surface.

B. On narrow strips and transitions, finish concrete pavement by hand. Thoroughly work concrete around reinforcement and embedded fixtures. Strike off concrete with strike-off screed. Move strike-off screed forward with combined transverse and longitudinal motion in direction work is progressing, maintaining screed in contact with forms, and maintaining slight excess of materials in front of cutting edge. Tamp concrete with tamping template. Use longitudinal float to level surface.

C. After completion of straightedge operation, make first pass of burlap drag or transverse broom as soon as construction operations permit and before water sheen has disappeared from surface. Follow with as many passes as required to produce desired texture depth. Permit no unnecessary delays between passes. Keep drag wet, clean and free from encrusted mortar during use.

.010 JOINTS AND JOINT SEALING

A. Conform to requirements of Section 02752 - Concrete Pavement Joints.

.011 CONCRETE CURING

A. Conform to requirements of Section 02753 - Concrete Pavement Curing.

.012 TOLERANCES

A. Test entire surface before initial set and correct irregularities or undulations. Bring surface within requirements of following test and then finish. Place 10 foot straightedge parallel to center of roadway to bridge depressions and touch high

spots. Do not permit ordinates measured from face of straight edge to surface of pavement to exceed 1 1/6 inch per foot from nearest point of contact. Maximum ordinate with 10- foot straightedge shall not exceed 1/8 inch. Grind spots in excess of required tolerances to meet surface test requirements. Restore texture by grooving concrete to meet surface finishing specifications.

.013 FIELD QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, the AW Project Manager may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. Compressive Strength Test Specimens: Make four test specimens for compressive strength test in accordance with ASTM C 31 for each 150 cubic yards or less of pavement that is placed in one day. Test two specimens at 7 days or at number of hours as directed by the AW Project Manager for high early strength concrete. Test remaining two specimens at 28 days. Test specimens in accordance with ASTM C 39. Minimum compressive strength shall be 3000 pounds per square inch for first two specimens and 3500 pounds per square inch at 28 days.

C. When compressive test indicates failure, make yield test in accordance with ASTM C 138 for cement content per cubic yard of concrete. When cement content is found to be less than that specified per cubic yard, increase batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. Minimum of one 4 inch core will be taken at random locations per 375 feet per 12 feet lane or 500 square yards of pavement to measure in-place depth. Measure depth in accordance with ASTM C 174. Each core may be tested for 28 day compressive strength according to methods of ASTM C 42. 28 day compressive strength of each core tested shall be a minimum of 3000 pounds per square inch.

E. Request, at option, three additional cores in vicinity of cores indicating nonconforming in-place depths at no cost to AW. In-place depth at these locations shall be average depth of four cores.

F. Fill cores and density test sections with new concrete paving or non shrink grout.

.014 NONCONFORMING PAVEMENT

A. Remove and replace areas of pavement found deficient in thickness by more than 10 percent, or that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. When measurement of any core is less than specified thickness by more than 10 percent, actual thickness of pavement in this area will be determined by taking additional cores at 10 foot intervals parallel to centerline in each direction from deficient core until, in each direction, core is taken which is not deficient by more than 10 percent. Exploratory cores for deficient thickness will not be used in averages for adjusted unit price. Exploratory cores are to be used only to determine length of pavement in unit that is to be removed and replaced. Replace nonconforming pavement sections at no additional cost to AW.

.015 UNIT PRICE ADJUSTMENT

A. Unit price adjustments shall be made for in-place depth determined by cores as follows:

1. Adjusted Unit Price shall be ratio of average thickness as determined by cores to thickness bid upon, times unit price.
2. Apply adjustment to lower limit of 90 percent and upper limit of 100 percent of unit price.
3. Average depth below 90 percent but greater than 80 percent may be accepted by Project Manager at adjusted Unit Price of:
   a. Unit Price Bid - [2 x (1-ratio) x Unit Price Bid]
   b. Ratio equals average core thickness divided by thickness bid upon
   c. 0.9 ratio pays 80 percent of unit price and 0.8 ratio pays 60 percent of unit price.
4. Average depth below 80 percent will be rejected by AW Project Manager.

.016 PAVEMENT MARKINGS

A. Restore pavement markings to match those existing in accordance with AW standard specifications and details and AW Project Manager's requirements.

.017 PROTECTION

A. Barricade pavement section to prevent use until concrete has attained minimum design strength. Cure barricade pavement section for minimum 72 hours before use. Do not open pavement to traffic until concrete is at least 10 days old. Pavement may be open to traffic earlier provided Contractor pays for testing and additional specimen once 7 day specified strength is obtained. Pavement may be opened when high early strength concrete is used meeting specified 72 hour strength.

B. High early strength concrete may be used to provide access at driveways, street intersections, esplanades and other locations approved by AW Project Manager.

C. On those sections of pavement to be opened to traffic, seal joints, clean pavement, and place earth against pavement edges before permitting use by

traffic. Opening of pavement to traffic shall not relieve responsibility for Work.

D. Maintain concrete paving in good condition until completion of Work.

E. Repair defects by replacing concrete to full depth.

END OF SECTION

SECTION 02752

CONCRETE PAVEMENT JOINTS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Joints for concrete paving; concrete sidewalks, concrete driveways, curbs, and curb and gutters.

B. Saw-cutting existing concrete or asphalt pavements for new joints.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for street pavement expansion joints, with or without load transfer, is on linear foot basis.
2. Payment for horizontal dowels is on a unit price basis for each horizontal dowel.
3. No separate payment will be made for formed or sawed street pavement contraction joints and longitudinal weakened plane joints. Include payment in unit price for Concrete Paving.
4. No separate payment will be made for joints for Curb, Curb and Gutter, Saw-tooth Curb, Concrete Sidewalks, and Concrete Driveways. Include payment in unit price for Curb and Gutter, Concrete Sidewalks, and Concrete Driveways.
5. Payment will be made for Preformed Expansion Joints on a linear foot basis only when field conditions require that sidewalk be moved adjacent to existing concrete structure (i.e., street, back of curb, etc.).
6. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

C. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

D. ASTM D 3405 - Standard Specification for Joint Sealants, Hot-Applied, for

Concrete and Asphalt Pavements.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit product data for joint sealing compound and proposed sealing equipment for approval.

C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval. Submit manufacturer's recommendation for placing sealant(s).

PART 2 P R O D U C T S

.01 BOARD EXPANSION JOINT MATERIAL

A. Filler board of selected stock. Use wood of density and type as follows:

1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.

.02 PREFORMED EXPANSION JOINT MATERIAL

A. Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.

.03 JOINT SEALING COMPOUND

A. Conform joint sealants to one of sealant classes described in this section.

B. Conform hot-poured rubber-asphalt compound to ASTM D 3405.

C. Two-component Synthetic Polymer.

1. Curing is to be by polymerization and not by evaporation of solvent or fluxing of harder particles.
2. Cure sufficiently at average temperature of 25 ± 1 degree C (77 ± 2 degrees F) so as not to pick up under wheels of traffic in maximum three hours.
3. Performance requirements shall meet above curing times and the requirements as follows:

Cold-Extruded and Cold-Pourable (Self-Leveling) Specifications	
Property	**Requirement**
Penetration, 25 C (77 F) 150 g Cone, 5 s, 0.1 mm (in.), maximum	130
Bond and Extension 50%, -29 C (-20 F), 3 cycles: • Dry Concrete Block • Steel blocks (Primed, if recommended by manufacturer) *Steel blocks shall be used when armor joints are specified	 Pass Pass
Flow at 70 C (158 F)	None
Water content % by mass, maximum	5.0
Resilience: • Original sample, % min. (cured) • Oven-aged at 70 C (158 F), % min.	 50 50
Cold-extruded material only - Cold Flow (10 minutes)	None

After bond and extension test, there shall be no evidence of cracking, separation or other opening that is over 3 millimeters (1/8 inch) deep in sealer or between sealer and test blocks.

4. Provide cold-extruded type for vertical or sloping joints.
5. Provide self-leveling type for horizontal joints.

D. Self-Leveling, Low Modulus Silicone or Polyurethane Sealant for Asphaltic Concrete and Portland Cement Concrete Joints. This shall be a single component self-leveling silicone or polyurethane material that is compatible with both asphalt and concrete pavements. The sealer shall not require a primer for bond; a backer rod shall be required which is compatible with the sealant; no reaction shall occur between rod and sealant.

E. When tested, self-leveling sealant shall meet following requirements:

Self Leveling, Low Modulus Silicone or Polyurethane Sealant	
Property	**Requirements**
Tack Free Time, 25 ± 1 C (77 ± 2 F), minutes	120 maximum
Nonvolatile content, % by mass	93 minimum
Tensile Strength and 24 Hour Extension Test: • Initial, 10-day cure, 25 ± 1 C (77 ± 2 F), kPa (psi) • After Water Immersion, kPa (psi) • After Heat Aging, kPa (psi) • After Cycling, -29 C (-20 F), 50%, 3 cycles, kPa (psi) • 24 Hour Extension	• 21 to 69 (3 to 10) • 21 to 69 (3 to 10) • 21 to 69 (3 to 10) • 21 to 69 (3 to 10) • Pass (All Specimens) After 24 hours, there shall be no evidence of cracking, separation or other opening that is over 3 mm (1/8 in.) deep at any point in the sealer or between the sealer and test blocks.

.04 LOAD TRANSMISSION DEVICES

A. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1 1/6 inch greater than diameter of dowel bar.

B. Deformed steel tie bars conforming to ASTM A 615, Grade 60.

.05 SUPPORTS FOR REINFORCING STEEL AND JOINT ASSEMBLY

A. Employ supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by AW Project Manager.

PART 3 EXECUTION

.01 PLACEMENT

A. When new Work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.

B. If limit of removal of existing concrete or asphalt pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

.02 CONSTRUCTION JOINTS

A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

.03 EXPANSION JOINTS

A. Place 3/4 inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

.04 CONTRACTION JOINTS

A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

.05 LONGITUDINAL WEAKENED PLANE JOINTS

A. Place longitudinal weakened plane joints at spaces indicated on Drawings. If more than 15 feet in width is poured, longitudinal joint must be saw cut. Seal groove with joint sealing compound.

.06 SAWED JOINTS

A. Use sawed joints as alternate to contraction and weakened plane joints. Use circular cutter capable of cutting straight line groove minimum of 1/4 inch wide. Maintain depth of one quarter of pavement thickness. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, continue until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.

B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Maintain ample supply of saw blades at work site during sawing operations. Maintain sawing equipment on job during concrete placement.

.07 JOINTS FOR CURB, CURB AND GUTTER

A. Place 3/4 inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement, at end of radius

returns at street intersections and driveways, and at curb inlets. Maximum spacing shall be 120-foot centers.

.08 JOINTS FOR CONCRETE SIDEWALKS

A. Provide 3/4 inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend expansion joint material full depth of slab.

.09 JOINTS FOR CONCRETE DRIVEWAYS

A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

.010 JOINT SEALING

A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F and weather is not foggy or rainy.

B. Use joint sealing equipment in like new working condition throughout joint sealing operation, and be approved by AW Project Manager. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.

C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.

D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

.011 PROTECTION

A. Maintain joints in good condition until completion of Work.

B. Replace damaged joints material with new material as required by this Section.

END OF SECTION

SECTION 02753

CONCRETE PAVEMENT CURING

PART 1 G E N E R A L

.01 SECTION INCLUDES

A. Curing of Portland cement concrete paving.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for concrete curing under this Section. Include payment in unit price for Concrete Paving, Concrete Sidewalks, Concrete Driveways, Curbs, and Curb and Gutters.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM C 156 - Standard Test Method for Water Retention by Concrete Curing Materials.

B. ASTM C 171 - Standard Specifications for Sheet Materials for Curing Concrete.

C. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit manufacturer's product data for cover materials and liquid membrane-forming compounds.

PART 2 PRODUCTS

.01 COVER MATERIALS FOR CURING

A. Conform curing materials to one of the following:

1. Polyethylene Film: Opaque pigmented white film conforming to requirements of ASTM C 171.
2. Waterproofed Paper: Paper conforming to requirements of ASTM C 171.

3. Cotton Mats: Single layer of cotton filler completely enclosed in cover of cotton cloth. Mats shall contain not less than 3/4 of a pound of uniformly distributed cotton filler per square yard of mat. Cotton cloth used for covering materials shall weigh not less than 6 ounces per square yard. Stitch mats so that mat will contact surface of pavement at all points when saturated with water.

.02 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Conform liquid membrane-forming compounds to ASTM C 309. Membrane shall restrict loss of water to not more than 0.55 kg/m^2 in 72 hours using test method ASTM C 156.

PART 3 EXECUTION

.03 CURING REQUIREMENT

A. Cure concrete pavement by protecting against loss of moisture for period of not less than 72 hours immediately upon completion of finishing operations. Do not use membrane curing for concrete pavement to be overlaid by asphalt concrete.

B. Failure to provide sufficient cover material shall be cause for immediate suspension of concreting operations.

.01 POLYETHYLENE FILM CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with polyethylene film so film will remain in direct contact with surface during specified curing period.

B. Cover entire surface and both edges of pavement slab. Overlap joints in film sheets minimum of 12 inches. Immediately repair tears or holes occurring during curing period by placing acceptable moisture-proof patches or replacing.

.02 WATERPROOFED PAPER CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, apply water in form of fine spray. Cover surface with waterproofed paper so paper will remain in direct contact with surface during specified curing period.

B. Prepare waterproofed paper to form blankets of sufficient width to cover entire surface and both edges of pavement slab, and not be more than 60 feet in length. Overlap joints in blankets caused by joining paper sheets not less than 5 inches and securely seal with asphalt cement having melting point of approximately 180 degrees F. Place blankets to secure overlap of at least 12 inches. Immediately repair tears or holes appearing in paper during curing period by cementing patches over defects.

.03 COTTON MAT CURING

A. Immediately after finishing surface, and after concrete has taken its initial set, completely cover surface with cotton mats, thoroughly saturated before application, maintaining contact with surface of pavement equally at all points.

B. Keep mats on pavement for specified curing period. Keep mats saturated so that, when lightly compressed, water will drip freely from them. Keep banked earth or cotton mat covering edges saturated.

.04 LIQUID MEMBRANE-FORMING COMPOUNDS

A. Immediately after free surface moisture, and after concrete has dispersed, apply liquid membrane-forming compound in accordance with manufacturer's instructions.

B. Moisten concrete by water fogging prior to application of membrane when surface has become dry.

C. Seal concrete surface with single coat at rate of coverage recommended by manufacturer and directed by AW Project Manager, but not less than one gallon per 200 square feet of surface area.

.05 TESTING MEMBRANE

A. Treated areas will be visually inspected for areas of lighter color of dry concrete as compared to dump concrete. Test suspected areas by placing few drops of water on surface. Membrane passes test when water stands in rounded beads or small pools which can be blown along surface of concrete without wetting surface.

B. Reapply membrane compound immediately at no cost to AW when membrane fails above test.

END OF SECTION

SECTION 02754

CONCRETE DRIVEWAYS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Portland cement concrete driveways.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete driveways is on square foot basis, including excavation.
2. No payment will be made for work in areas where driveway has been removed or replaced for Contractor's convenience.
3. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for Work in this Section is included in total Stipulated Price.

PART 2 PRODUCTS

.01 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements for reinforcing steel of Section 02751 - Concrete Paving.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02752 - Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Section 02752 - Concrete Pavement Joints.

E. Sub grade Materials: Conform to sub grade material requirements.

PART 3 EXECUTION

.01 PREPARATION

A. Prepare sub grade in accordance with contract document requirements.

.02 PLACEMENT

A. Place and finish concrete in accordance with applicable portions of Section 02751 - Concrete Paving.

.03 JOINTS

A. Install joints in concrete driveway in accordance with Section 02752 - Concrete Pavement Joints.

.04 CONCRETE CURING

A. Cure concrete driveway in accordance with Section 02753 - Concrete Pavement Curing.

.05 PROTECTION

A. Conform to applicable requirements of Section 02753 - Concrete Pavement Curing.

END OF SECTION

SECTION 02771

CURB, CURB AND GUTTER, AND HEADERS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Reinforced concrete curb, reinforced monolithic concrete curb and gutter, and mountable curb.

B. Paving headers and railroad headers poured monolithically with concrete base or pavement.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for curbs, curbs and gutter, and esplanade curbs is on linear foot basis measured along face of curb.
2. Payment for 3 foot concrete valley gutter is on a linear foot basis.
3. Payment for mountable concrete curbs is on a square foot basis.
4. Payment for concrete paving headers and concrete railroad headers is on a linear foot basis.
5. Payment for headers is on linear foot basis measured between lips of gutters adjacent to concrete base and measured between backs of curbs adjacent to concrete pavement.
6. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit details of proposed formwork for approval.

PART 2 PRODUCTS

.01 MATERIALS

C. Concrete: Conform to material and proportion requirements for concrete of

Section 02751 - Concrete Paving.

A. Reinforcing Steel: Conform to material requirements for welded wire fabric of Section 02751 - Concrete Paving.

B. Grout: Nonmetallic, nonshrink grout containing no chloride producing agents conforming to following requirements.

1. Compressive strength
   a. At 7 days: 3500 psi
   b. At 28 days: 8000 psi
2. Initial set time: 45 minutes
3. Final set time: 1.5 hours

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02752 - Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Section 02752 - Concrete Pavement Joints.

E. Mortar: Mortar finish composed of one part Portland cement and 1 1/2 parts of fine aggregate. Use only when approved by AW Project Manager.

PART 3 EXECUTION

.01 PREPARATION

A. Prepare sub grade in accordance with applicable portions of sections on excavation and fill, embankment, and sub grade and roadbed.

.02 PLACEMENT

A. Guideline: Set to follow top line of curb. Attach indicator to provide constant comparison between top of curb and guideline. Ensure flow lines for monolithic curb and gutters conform to slopes indicated on Drawings.

B. Forms: Brace to maintain position during pour. Use metal templates cut to section shown on Drawings.

C. Reinforcement: Secure in position so that steel will remain in place throughout placement. Reinforcing steel shall remain at approximate center of base or pavement as indicated on Drawings.

D. Joints: Place in accordance with Section 02752 - Concrete Pavement Joints. Place dummy groove joints at to match concrete pavement joints at right angles to curb lines. Cut dummy grooves 1/4 inch deep using approved edging tool.

E. Place concrete in forms to required depth. Consolidate thoroughly. Do not permit rock pockets in form. Entirely cover top surfaces with mortar.

.03 MANUAL FINISHING

A. After concrete is in place, remove front curb forms. Form exposed portions of curb, and of curb and gutter, using mule which conforms to curb shape, as shown on Drawings.

B. Thin coat of mortar may be worked into exposed face of curb using mule and two-handled wooden darby at least 3 feet long.

C. Before applying final finish move 10 foot straightedge across gutter and up curb to back form of curb. Repeat until curb and gutter are true to grade and section. Lap straightedge every 5 feet.

D. Steel trowel finish surfaces to smooth, even finish. Make face of finished curb true and straight.

E. Edge outer edge of gutter with 1/4 inch edger. Finish edges with tool having 1/4 inch radius.

F. Finish visible surfaces and edges of finished curb and gutter free from blemishes, form marks and tool marks. Finished curb or curb and gutter shall have uniform color, shape and appearance.

.04 MECHANICAL FINISHING

A. Mechanical curb forming and finishing machines may be used instead of, or in conjunction with, previously described methods, when approved by Project Manager. Use of mechanical methods shall provide specified curb design and finish.

.05 CURING

A. Immediately after finishing operations, cure exposed surfaces of curbs and gutters in accordance with Section 02753 - Concrete Pavement Curing.

.06 TOLERANCES

A. Top surfaces of curb and gutter shall have uniform width and shall be free from humps, sags or other irregularities. Surfaces of curb top, curb face and gutter shall not vary more than 1/8 inch from edge of straightedge laid along them, except at grade changes.

.07 PROTECTION

A. Maintain curbs and gutters in good condition until completion of Work.

B. Replace damaged curbs and gutters to comply with this Section.

END OF SECTION

SECTION 02772

CONCRETE MEDIANS AND DIRECTIONAL ISLANDS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Portland cement concrete medians and directional islands.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete medians and directional islands is on square yard basis measured from back of curbs.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

PART 2 PRODUCTS

.01 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements for welded wire fabric of Section 02751 - Concrete Paving.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02752 - Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint filler of Section 02752 - Concrete Pavement Joints.

E. Sub grade Materials: Conform to sub grade material to Contract Document requirements.

PART 3 EXECUTION

.01 SUBGRADE

A. Prepare sub grade in accordance with Contract Document requirements.

.02 PLACEMENT OF CONCRETE

A. Place and finish concrete in accordance with applicable portions of Section 02751 - Concrete Paving.

.03 JOINTS

A. Install joints in accordance with Section 02752 - Concrete Pavement Joints.

.04 CONCRETE CURING

A. Cure concrete in accordance with Section 02753 - Concrete Pavement Curing.

.05 PROTECTION

A. Maintain concrete medians and directional islands in good condition until completion of work.

B. Replace damaged concrete medians and directional islands to comply with this Section.

END OF SECTION

SECTION 02775

CONCRETE SIDEWALKS

PART 1 GENERAL

.01 SECTION INCLUDES

A. Reinforced concrete sidewalks.

B. Wheelchair ramps.

C. Reinforced slope paving.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for concrete sidewalks is on square foot basis.
2. No payment will be made for work outside these limits or in areas where driveway has been removed or replaced for Contractor's convenience.
3. Payment for wheelchair ramps of each type specified is on square foot basis. Removal and replacement of existing sidewalk, curb or curb and gutter and saw-cutting is paid by unit cost for each item. Sodding will be paid one foot on each side of sidewalk unless otherwise noted. Staining of wheelchair ramps is included in cost of ramp.
4. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in Field.

B. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C 138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

E. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

F. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

G. ASTM D 698 - Standard Test Methods for Laboratory Compaction

Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3).

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certified testing results and certificates of compliance.

PART 2 PRODUCTS

.01 MATERIALS

A. Concrete: Conform to material and proportion requirements for concrete of Section 02751 - Concrete Paving.

B. Reinforcing Steel: Conform to material requirements of Section 02751 - Concrete Paving for reinforcing steel. Use No. 3 reinforcing bars.

C. Preformed Expansion Joint Material: Conform to material requirements for preformed expansion joint material of Section 02752 - Concrete Pavement Joints.

D. Expansion Joint Filler: Conform to material requirements for expansion joint material of Section 02752 - Concrete Pavement Joints.

E. Forms: Use straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. The use of 2 inch by 4 inch lumber as forms will not be allowed.

F. Sand Bed: Conform to material requirements for bank run sand of Section 02320 - Utility Backfill Materials.

G. Sodding: Conform to material requirements for sodding of Section 02922 – Sodding..

H. Coloring for wheelchair ramps: Conform to material requirements for colored concrete of Section 02761 - Colored Concrete for Medians and Sidewalks. Color shall be Brick Red or as shown on the drawings.

PART 3 EXECUTION

.01 REPLACEMENT

A. Replace sidewalks and slope paving which are removed or damaged during construction with thickness and width equivalent to one removed or damaged, unless otherwise shown on Drawings. Finish surface (exposed aggregate, brick pavers, etc.) to match existing sidewalk.

B. Provide replaced and new sidewalks with wheelchair ramps when sidewalk intersects curb at street or driveway.

.02 PREPARATION

A. Identify and protect utilities which are to remain.

B. Protect living trees, other plant growth, and features designated to remain.

C. Conduct clearing and grubbing operations in accordance with Section. 02233 - Clearing and Grubbing.

D. Excavate subgrade 6 inches beyond outside lines of sidewalk. Shape to line, grade and cross section. Compact subgrade to minimum of 90 percent maximum dry density at optimum to 3 percent above optimum moisture content, as determined by ASTM D 698.

E. Immediately after subgrade is prepared, cover with compacted sand bed to depth as shown on

F. Drawings. Lay concrete when sand is moist but not saturated.

.03 PLACEMENT

A. Setting Forms: Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. Use of 2 x 4's boards as forms will not be allowed. Securely stake forms to line and grade. Maintain position during concrete placement.

B. Reinforcement:

1. Install reinforcing bars.

2. Install reinforcing steel as shown on the drawings. Lay longitudinal bars in walk continuously, except through expansion joints.

3. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.

4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy, and provide headers as required.

5. Use sufficient number of chairs for steel reinforcement bars to maintain position of bars within allowable tolerances. Place reinforcement as shown on Drawings. In plane of steel parallel to nearest surface of concrete, bars shall not vary from plan placement by more than 1 1/2 of spacing between bars. In plane of steel perpendicular to nearest surface of concrete, bars shall not vary from plan placement by more than 1/4 inch.

C. Expansion Joints: Install expansion joints with load transfer units in accordance with Section 02752 - Concrete Pavement Joints.

D. Place concrete in forms to specified depth and tamp thoroughly with "jitterbug" tamp, or other acceptable method. Bring mortar to surface.

E. Strike off to smooth finish with wood strike board. Finish smoothly with wood

hand float. Brush across sidewalk lightly with fine-haired brush.

F. Apply coating to wheelchair ramp with contrasting color to match existing condition.

G. Unless otherwise indicated on Drawings, mark off sidewalk joints 1/8 inch deep, at spacing equal to width of walk. Use joint tool equal in width to edging tool.

H. Finish edges with tool having 1/4 inch radius.

I. After concrete has set sufficiently, refill space along sides of sidewalk to one-inch from top of walk with suitable material. Tamp until firm and solid, place sod as applicable. Dispose of excess material off site. Repair driveways and parking lots damaged by sidewalk excavation in accordance with Section 02951 - Pavement Repair and Resurfacing.

.04 CURING

A. Conform to requirements of Section 02753 - Concrete Pavement Curing.

.05 FIELD QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, the AW Project Manager may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. Compressive Strength Test Specimens: Four test specimens for compressive strength test will be made in accordance with ASTM C 31 for each 30 cubic yards or less of sidewalk that is placed in one day. Two specimens will be tested at 7 days. Remaining two specimens will be tested at 28 days. Specimens will be tested in accordance with ASTM C 39. Minimum compressive strength: 2500 psi at 7 days and 3000 psi at 28 days.

C. Yield test for cement content per cubic yard of concrete will be made in accordance with ASTM C 138. When cement content is found to be less than that specified per cubic yard, reduce batch weights until amount of cement per cubic yard of concrete conforms to requirements.

D. If the Contractor places concrete without notifying the laboratory, AW will have the concrete tested by means of core test as specified in ASTM C 42. When concrete does not meet specification, cost of test will be deducted from payment.

E. Sampling of fresh concrete shall be in accordance with ASTM C 172.

F. Take slump tests when cylinders are made and when concrete slump appears excessive.

G. Concrete shall be acceptable when average of two 28 day compression tests is

equal to or greater than minimum 28 day strength specified.

H. If either of two tests on field samples is less than average of two tests by more than 10 percent, that entire test shall be considered erratic and not indicative of concrete strength. Core samples will be required of in-place concrete in question.

I. If 28 day laboratory test indicates that concrete of low strength has been placed, test concrete in question by taking cores as directed by AW Project Manager. Take and test at least three representative cores as specified in ASTM C 42 and deduct cost from payment due.

.06 NONCONFORMING CONCRETE

A. Remove and replace areas that fail compressive strength tests, with concrete of thickness shown on Drawings.

B. Replace nonconforming sections at no additional cost to AW.

.07 PROTECTION

A. Maintain newly placed concrete in good condition until completion of Work.

B. Replace damaged areas.

END OF SECTION

SECTION 02911

TOPSOIL

PART 1 GENERAL

.01 SECTION INCLUDES

A. Furnishing and placing topsoil for finish grading and for seeding, sodding, and planting.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for topsoil under this Section. Include payment in Section 02921 - Hydro-mulch Seeding or Section 02922 - Sodding.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

PART 2

PRODUCTS

.01 TOPSOIL

A. Topsoil shall be fertile, friable, natural sandy loam surface soil obtained from excavation or borrow operations having following characteristics:

1. pH value of between 5.5 and 6.5
2. Liquid limit: 50 or less
3. Plasticity index: 20 or less
4. Gradation: maximum of 10 percent passing No. 200 sieve

B. Topsoil shall be reasonably free of subsoil, clay lumps, weeds, non-soil materials, and other litter or contamination. Topsoil shall not contain roots, stumps, and stones larger than 2 inches.

C. Obtain topsoil from naturally well-drained areas where topsoil occurs at minimum depth of 4 inches and has similar characteristics to that found at placement site. Do not obtain topsoil from areas infected with growth of, or reproductive parts of nut grass or other noxious weeds.

PART 3 EXECUTION

.01 EXAMINATION

A. Excavate topsoil for esplanades and areas to receive grass or landscaping from areas to be further excavated. Stockpile in area approved by Project Manager.

B. Stockpile topsoil to depth not exceeding 8 feet. Cover to protect from erosion.

.02 TOPSOIL EXCAVATION

A. Conform to excavation and stockpiling requirements of Section 02315 - Roadway Excavation.

.03 PLACEMENT

A. Place no topsoil until subgrade has been approved. For areas to be seeded or sodded, scarify or plow existing material to minimum depth of 4 inches, or as indicated on Drawings. Remove vegetation and foreign inorganic material. Place 4 inches of topsoil on loosened material and roll lightly with appropriate lawn roller to consolidate topsoil.

B. Increase depth of topsoil to 6 inches when placed over sand bedding and backfill materials specified in Section 02320 - Utility Backfill Material.

C. For areas to receive shrubs or frees, excavate existing material and place topsoil to depth and dimensions shown on Drawings.

D. Remove spilled topsoil from curbs, gutters, and, paved areas and dispose of excess topsoil in accordance with requirements of Waste Material Disposal.

E. Place topsoil to promote good drainage and compact with light roller. Water topsoil after placement until saturated for minimum depth 6 inches, fill in and recompact areas of settlement.

.04 PROTECTION

A. Protect topsoil from wind and water erosion until planting is completed.

END OF SECTION

SECTION 02915

TREE PLANTING

PART 1. GENERAL

.01 SECTION INCLUDES

A. Street right-of-way tree planting and maintenance.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for tree planting is on unit price basis for each tree planted.
2. When shown on Drawings or directed by AW Project Manager to remove and relocate tree affected by trench zone, work shall be paid for under one of the following bid items.
   a. Bid item "Remove and Relocate Tree" includes moving tree with truck mounted tree spade and replanting same tree in new location. Payment is for each tree removed and relocated.
   b. Bid item "Remove, Temporary Store and Replant Tree" includes moving tree with truck mounted tree spade and replanting tree at temporary location, (determined by Contractor) maintaining tree until construction is complete and replanting same tree back to its original location. Payment is for each tree removed, stored and replanted.
3. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ANSI Z 60.1 Nursery Stock.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certification from supplier that each type of tree conforms to these specification requirements.

C. For unpackaged materials, submit analysis by recognized laboratory made in accordance with methods established by Association of Official Agriculture Chemists, when applicable.

D. Submit name and experience of qualified Arborist to AW Project Manager.

E. Submit temporary tree storage location. Location must be outside public right-of-way and within 5 miles of project site, unless otherwise approved by AW Project Manager.

.05 QUALITY ASSURANCE

A. Landscaper shall be a firm specializing in landscape and planting work.

B. Do not make substitutions of approved trees unless approved in writing by AW Project Manager. When specified planting material is not obtainable, submit proof of non-availability together with proposal for use of equivalent material. Substitutions of larger size or better grade than specified will be allowed, but with no increase in unit price.

.06 DELIVERY, STORAGE, AND HANDLING

A. Ship trees with Certificates of Inspection as required by governing authorities. Label each tree and shrub with securely attached waterproof tag bearing legible designation of botanical and common name. Do not remove container grown stock from containers before time of planting.

B. Deliver packaged materials in fully labeled original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at Site.

C. Materials shall not be pruned prior to installation unless approved by Project Manager in writing. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches, or destroy natural shape. Use protective covering during delivery.

.07 WARRANTY

A. Warrant trees against defects including death, unsatisfactory growth, or loss of shape due to improper pruning, maintenance, or weather conditions, for 1 year after completion of planting. Plumb leaning trees during warranty period.

B. Remove and replace trees found to be dead during warranty period. Remove and replace trees which are in doubtful condition at end of warranty period, or when approved by Project Manager, extend warranty period for trees for full growing season.

PART 2 PRODUCTS

.01 TREES

A. Provide container grown trees which are straight and symmetrical and have persistently preferred main leader. Crown shall be in good overall proportion to entire height of tree with branching configuration as recommended by ANSI Z60.1 for type and species specified. Where clump is specified, furnish plant having minimum of three stems originating from common base at ground line.

Measure trees by average caliper of trunk as follows:

1. For trunks up to 4 inches or less in diameter, measure caliper 6 inches above top of root ball.
2. For trunks more than 4 inches, measure caliper 12 inches above top of root ball.
3. Caliper measurements shall be by diameter tape measure. Indicated calipers on plans are minimum. Averaging of plant calibers will not be allowed.

B. Trees shall conform to following requirements:

1. Healthy, vigorous stock, grown in recognized nursery.
2. Free of disease, insects, eggs, larvae; and free of defects such as knots, sun-scald, injuries, abrasions, disfigurement, or borers and infestations.

.02 SOIL PRODUCTS

A. Topsoil: Conform to requirements of Section 02911 - Topsoil.

B. Peat moss, bark, and fertilizer: Use material recommended by nursery for establishment of healthy stock after replanting.

.03 STAKES AND GUYS

A. Provide minimum 8-foot long steel T-stakes and 1 inch wide plastic tree chains.

B. Where applicable for anchoring trees, use wood deadmen of at least 2 by 4 stock, 36 inches long and buried 3 feet. Provide white surveyor's plastic tape for flagging tree guys.

.04 TREE WRAP, TWINE, AND SEAL

A. Wrap: First quality, bituminous impregnated tape, corrugated or crepe paper, specifically manufactured for tree wrapping and having qualities to resist insect infestation.

B. Twine: Lightly tarred, medium-coarse sisal (lath) yarn. Do not use nails or staples to fasten wrapping.

C. Seal: Commercially available asphaltic-base black emulsion specifically produced for use in sealing tree cuts and wounds.

.05 WATER

A. Water shall be potable from municipal water supplies.

.06 SOURCE QUALITY CONTROL

A. Notify AW Project Manager, prior to installation, of location where trees that have been selected for planting may be inspected. Plant material will be inspected for compliance with following requirements.

1. Genus, species, variety, size and quality.
2. Size and condition of balls and root systems, insects, injuries and latent defects.

PART 3 EXECUTION

.01 PREPARATION

A. Schedule work so that planting can proceed rapidly as portions of site become available. Plant trees after final grades are established and prior to planting of lawns, unless otherwise approved by Project Manager in writing. When planting of trees occurs after seeding work, protect lawn areas and promptly repair damage to lawns resulting from tree planting operations.

B. Layout individual trees at locations shown on Drawings. In case of conflicts, notify Project Manager before proceeding with Work. Trees shall be staked and approved by Project Manager prior to planting.

.02 PREPARATION OF PLANTING SOIL

A. Before mixing, clean topsoil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.

B. Strip and utilize 4 inch layer of top soil, placed on esplanades under Section 02921 - Hydro-mulch Seeding, for planting soil mixture.

C. Mix recommended soil amendments with topsoil at following rates:

1. Top soil: 50 percent.
2. Peat moss: 25 percent.
3. Well rotted Bark: 25 percent.
4. Fertilizer: Rate recommended by nursery.

D. Delay mixing of fertilizer when planting will not follow placing of planting soil within 48 hours, unless otherwise directed.

E. Incorporate amendments into soil as part of soil preparation process prior to fine grading, fertilizing, and planting. Broadcast or spread amendments evenly at specified rate over planting area. Thoroughly incorporate amendments into top 3 or 4 inches of soil until amendments are pulverized and have become homogeneous layer of topsoil ready for planting.

.03 PLANTING

A. Excavate pits, beds, or trenches with vertical sides and with bottom of excavation raised minimum of 6 inches at center for proper drainage. Provide following minimum widths:

1. 15 gallon containers or larger, 2 feet wider than diameter of root ball.
2. 1 and 5 gallon containers, 6 inches wider than diameter of root ball.

B. When conditions detrimental to plant growth are encountered, such as unsatisfactory soil, obstructions, or adverse drainage conditions, notify AW Project Manager before planting.

C. Deliver trees after preparations for planting have been completed and plant immediately. When planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap, or other acceptable means of retaining moisture, and water as needed.

D. Set root ball on undisturbed soil in center of pit or trench and plumb plant. Place plants at level that, after settlement, natural relationship of plant crown with ground surface will be established.

E. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

F. Dish top of backfill to allow for mulching. Mulch pits, trenches and planted areas. Provide not less than 4 inch thickness of mulch, work into top of backfill, and finish level with adjacent finish grades. Cover entire root ball.

G. Prune, thin out and shape trees in accordance with standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed in writing, do not cut tree leaders, and remove only injured and dead branches from flowering trees. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

H. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures.

I. Guy and stake trees immediately after planting.

J. Control dust caused by planting operations. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

.04 FIELD QUALITY CONTROL

A. Project Manager may reject unsatisfactory or defective material at anytime during progress of Work. Remove rejected trees immediately from site and replace with specified materials. Plant material not installed in accordance with these Specifications will be rejected.

B. An inspection to determine final acceptance will be conducted by AW Project Manager at end of 12 month maintenance period. Additional inspections will be conducted for extended warranty periods provided for in paragraph 1.07B.

.05 MOVING EXISTING TREES

A. Perform tree moving and replanting by a professional Arborist during dormant growth season.

B. Provide tree spade of adequate size as directed by professional Arborist.

.06 MAINTENANCE

A. Maintain trees during planting operations and for period of 12 months after completion of planting.

B. Water trees to full depth minimum of once each week, or as required to maintain healthy vigorous growth.

C. Prune, cultivate, and weed as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports, and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.

.07 CLEANUP AND PROTECTION

A. During planting work, keep pavements clean and work *area* in orderly condition.

B. Protect planting work and materials from damage due to planting operations. Maintain protection during installation and maintenance period. Treat, repair, or replace damaged planting work as directed by AW Project Manager.

C. Dispose of excess soil and waste off site. On-site burning of combustible cleared materials will not be permitted.

END OF SECTION

SECTION 02921

HYDRO MULCH SEEDING

PART 1 GENERAL

.01 SECTION INCLUDES

A. Seeding, fertilizing, mulching, and maintenance of areas indicated on Drawings.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for hydro mulch seeding is on an acre basis.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certification from supplier that each type of seed conforms to these specifications and requirements of applicable State Seed Law. Certification shall accompany seed delivery.

C. Submit certificate stating that fertilizer complies with these specifications and requirements of applicable State Fertilizer Law.

PART 2 PRODUCTS

.01 MATERIALS

A. Topsoil: Conform to material requirements of Section 02911 - Topsoil.

B. Seed: Conform to U.S. Department of Agriculture rules and regulations of Federal Seed Act and applicable State Seed Law. Seed shall be certified 90 percent pure and furnish 80 percent germination and meet following requirements:

1. Rye: Fresh, clean, Italian rye grass seed (lollium multi-florum), mixed in labeled proportions. As tested, minimum percentages of impurities and germination must be labeled. Deliver in original unopened containers.
2. Bermuda: Extra-fancy, treated, lawn type common bermuda (Cynodon dactylon). Deliver in original, unopened container showing weight, analysis, name of vendor, and germination test results.

3. Wet, moldy, or otherwise damaged seed will not be accepted.
4. Seed requirements, application rates, and planting dates are:

TYPE	APPLICATION RATE POUNDS/A	PLANTING DATE
Hulled Common Bermuda Grass 98/88 Unhulled Common Bermuda Grass 98/88	40 40	Jan 1 to Mar 31
Hulled Common Bermuda Grass 98/88	40	Apr 1 to Sep 30
Hulled Common Bermuda Grass 98/88 Unhulled Common Bermuda Grass 98/88 Annual Rye Grass (Gulf)	40 40 30	Oct 1 to Dec 31

C. Fertilizer: Dry and free flowing, inorganic, water soluble commercial fertilizer, which is uniform in composition. Deliver in unopened containers which bear manufacturers guaranteed analysis. Caked, damaged, or otherwise unsuitable fertilizer will not be accepted. Fertilizer shall contain minimum percentages of following elements:

1. Nitrogen: 10 Percent
2. Phosphoric Acid: 20 Percent
3. Potash: 10 Percent

D. Mulch:

1. Virgin wood cellulose fibers from whole wood chips having minimum of 20 percent fibers 0.42 inches in length and 0.01 inches in diameter.
2. Cellulose fibers manufactured from recycled newspaper and meeting same fiber content and size as for cellulose fibers from wood chips.
3. Dye mulch green for coverage verification purposes. 02921-2

E. Soil Stabilizer: "Terra Tack 1" or approved equal.

F. Weed control agent: Pre-emergent herbicide for grass areas, such as "Benefin," or approved equal.

PART 3 EXECUTION

.01 PREPARATION

A. Place and compact topsoil in accordance with requirements of Section 02911 - Topsoil.

B. Dispose of Objectionable and Waste Materials off site as per Contract Document requirements.

.02 APPLICATION

A. Seed: Apply uniformly at rates given in Paragraph 2.01 B for type of seed and planting date.

B. Fertilizer: Apply uniformly at rate of 500 pounds per acre.

C. Mulch: Apply uniformly at rate of 50 pounds per 1000 square feet.

D. Soil Stabilizer: Apply uniformly at rate of 40 pounds per acre.

E. Weed Control Agent: Apply at manufacturer's recommended rate prior to hydro mulching.

F. Sod: Lay single row of sod along perimeter where topsoil and pavement intersect. Apply in conformance to Section 02922 - Sodding.

G. Suspend operations under conditions of drought, excessive moisture, high winds, or extreme or prolonged cold. Obtain AW Project Manager approval before resuming operations.

.03 MAINTENANCE

A. Maintain grassed areas minimum of 90 days, or as required to establish an acceptable lawn. For areas seeded in fall, continue maintenance following spring until acceptable lawn is established.

B. Maintain grassed areas by watering, fertilizing, weeding, and trimming.

C. Repair areas damaged by erosion by regrading, rolling and replanting.

D. Reseed small, sparse grass areas. When sparse areas exceed 20 percent of planted area, reseed by hydro mulch.

E. Mow grass when height reaches 3 1/2 inches or greater on average before final acceptance. Mow to height of 2 1/2 inches.

END OF SECTION

SECTION 02922

SODDING

PART 1 GENERAL

.01 SECTION INCLUDES

A. Restoration of existing lawn areas disturbed by construction shall be by installation of new sod.

B. Planting of sod within areas designated on Drawings for purpose of surface stabilization, channel stabilization or vegetation buffer strips.

C. Sod is defined as blocks, squares, strips of turf grass, and adhering soil used for vegetative planting. To be placed edge to edge for complete coverage.

D. Lawn is defined as ground covered with fine textured grass kept neatly mowed.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. Payment for sodding is on square yard basis.
2. Refer to Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

.04 QUALITY ASSURANCE

A. Sod only when weather and soil conditions are deemed by AW Project Manager to be suitable for proper placement.

B. Water and fertilize new sod.

C. Guarantee sod to be growing 30 days after date of substantial completion.

D. Maintenance Period:

1. Begin maintenance immediately after each section of grass sod is installed and continue for 30 day period from date of substantial completion.
2. Resod unacceptable areas.
3. Water, fertilize, control disease and insect pests, mow, edge, replace unacceptable materials, and perform other procedures consistent with good

horticultural practice to ensure normal, vigorous and healthy growth. Install disease control within guidelines set forth by Structural Pest Control Board of the State where the project is being completed.

E. Notify AW Project Manager 10 days before end of maintenance period for inspection.

PART 2 P R O D U C T S

.01 SOD

A. Species: Bermuda (Cynodon Dactylon), Buffalo (Buchloe Dactyloides), or St. Augustine (Stenotaphrum Secundatum) Gulf Coast variety to match existing sod.

B. Contents: 95 percent permanent grass suitable to climate in which it is to be placed; not more than 5 percent weeds and undesirable grasses; good texture, free from obnoxious grasses, roots, stones and foreign materials.

C. Size: 12 inch wide strips, uniformly 2 inches thick with clean-cut edges.

D. Sod is to be supplied and maintained in healthy condition as evidenced by grass being normal green color.

.02 FERTILIZER

A. Available nutrient percentage by weight: 12 percent nitrogen, 4 percent phosphoric acid, and 8 percent potash; or 15 percent nitrogen, 5 percent phosphoric acid, and 10 percent potash.

.03 WEED AND INSECT TREATMENT

A. Provide acceptable treatment to protect sod from weed and insect infestation. Submit treatment method to AW Project Manager for approval. Install insect and disease control within guidelines set forth by Structural Pest Control Board of the State where the project is being completed.

.04 WATER

A. Potable, available on-site through Contractor's water trucks. Contractor may use AW water system hydrants when water use is measured through Contractor's meter. Do not use private resident's water.

.05 BANK SAND

A. Free of clay lumps, roots, grass, salt or other foreign material.

PART 3 EXECUTION

.01 PREPARATION

A. Verify that soil placement and compaction have been satisfactorily completed. Verify that soil is within allowable range of moisture content.

B. Top soil shall be free of weeds and foreign material immediately before sodding.

C. Do not start work until conditions are satisfactory. Do not start work during inclement or impending inclement weather.

D. Rake areas to be sodded smooth, free from unsightly variations, bumps, ridges or depressions.

E. Spread 2 inch layer of bank sand over areas to be sodded prior to planting of sod.

F. Apply fertilizer at rate of 25 pounds per 1000 square feet. Apply after raking soil surface and not more than 48 hours prior to laying sod. Mix thoroughly into upper 2 inches of soil. Lightly water to aid in dissipation of fertilizer.

.02 APPLICATION

A. Full Sodding: Lay sod with closely fitted joints leaving no voids and with ends of sod strips staggered. Lay sod within 24 hours of harvesting.

B. On slopes 2:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

C. Prior to placing sod, on slopes 3:1 or where indicated, place Hold/Gro or Roll Lite or equal over topsoil. Securely anchor in place with posts sunk firmly into ground at maximum 16 feet on center along pitch of slope and equal to width of wire mesh horizontally across slopes.

D. After sod is laid, irrigate thoroughly to secure 6-inch minimum penetration into soil below sod.

E. Tamp and roll sod with approved equipment to eliminate minor irregularities and to form close contact with soil bed immediately after planting and watering. Submit type of tamping and rolling equipment to be used to AW Project Manager for approval, prior to construction.

.03 MAINTENANCE

A. Watering:

1. Water lawn areas once a day with minimum 1/2 inch water for first 3 weeks after area is sodded.

2. After 3 week period, water twice a week with 3/4 inch of water each time unless comparable amount has been provided by rain.

3. Make weekly inspections to determine moisture content of soil unless soil is in frozen condition.

4. Water in afternoon or at night to enable soil to absorb maximum amount of water

with minimum evaporation.

B. Mowing:

1. Mow sod at intervals which will keep grass height from exceeding 3 1/2 inches.
2. Set mower blades at 2 1/2 inches.
3. Do not remove more than one-half of grass leaf surface.
4. Mow sodded areas requiring mowing within 1 month after installation with light-weight rotary type mower. Mow sod only when dry and not in saturated or soft condition.
5. Remove grass clippings during or immediately after mowing.

C. Fertilizer and Pest Control:

1. Evenly spread fertilizer composite at rate of 40 pounds per 5000 square feet or as recommended by manufacturer. Do not place fertilizer until 2 weeks after placement of sod.
2. Restore bare or thin areas by topdressing with mix of 50 percent sharp sand and 50 percent sphagnum peat moss.
3. Apply mixture 1/4 to 1/2 inch thick.
4. Treat areas of heavy weed and insect infestation as recommended by treatment manufacturer.

D. Restrict all traffic from sodded areas until sod is established or for minimum 10 days during growing season. Use wood lath and plastic tape to cordon sodded areas. Maintain tape and lath throughout for minimum 30 days during growing season.

.04 CLEANUP

A. During the course of planting, remove excess and waste materials; keep lawn areas clean and take precautions to avoid damage to existing structures, plants, grass, and streets.

B. Remove barriers, signs, and other Contractor material and equipment from project site at termination of establishment period.

C. Dispose of unused materials and rubbish of site as per Contract Document requirements.

END OF SECTION

SECTION 02951

PAVEMENT REPAIR AND RESURFACING

PART 1 GENERAL

.01 SECTION INCLUDES

A. Repairing and resurfacing streets, highways, driveways, sidewalks, and other pavements that have been cut, broken, or otherwise damaged during construction.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for pavement repair and resurfacing under this Section. Payment will be in accordance with Measurement and Payment for work as required in appropriate sections.
2. Refer to Measurement and Payment for other unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this section is included in total Stipulated Price.

PART 2 PRODUCTS

.01 MATERIALS

A. Subgrade:

1. Provide backfill material as required by applicable excavation and fill sections Sections 02315 through 02319.
2. Provide material for stabilization as required.

B. Base: Provide base material as required by applicable portions of Section 02711 - Hot Mix Asphaltic Base Course, and Section 02712 - Cement Stabilized Base Course.

C. Pavement: Provide paving materials as required by applicable portions of Section 02741 - Asphaltic Concrete Pavement, Section 02751- Concrete Paving, Section 02754 - Concrete Driveways, and Section 02771 - Curb, Curb and Gutter, and Headers, and Section 02775 - Concrete Sidewalks.

PART 3 EXECUTION

.01 PREPARATION

A. Notify AW prior to commencement of excavation in pavement for which an Excavation in Public Way permits has been obtained. Follow directions contained in the permit.

B. Conform to requirement of Section 02221 - Removing Existing Pavements and Structures, for removals.

C. Saw cut pavement 18 inches wider than width of trench needed to install utilities unless otherwise indicated on Drawings.

D. When removing pavement to existing deformed metal strip (i.e. dummy joint), saw cut pavement minimum 2 inches deep on opposite side of deformed metal strip. Place saw joint far enough behind deformed metal strip to obtain continuously straight joint. Remove damaged portion of deformed metal strip as required to provide proper joint. Saw cut and remove metal strip before placement of new concrete pavement.

E. Protect edges of existing pavement to remain from damage during removals, utility placement, backfill, and paving operations. For concrete pavement, protect undisturbed subgrade that is to remain to support replacement slab.

F. Dowel in existing pavement where no reinforcement is found or is broken due to construction activities. Unless otherwise directed by AW Project Manager, provide No. 6 bars 24 inches long, drilled and embedded 8 inches into center of existing slab with PO-ROC epoxy grout or approved equal. Space dowels to match new pavement reinforcement spacing.

G. Provide transitional paving and earthwork as required to tie proposed pavement to existing pavement when unable to dowel new pavement into existing pavement.

.02 INSTALLATION

A. Parking Areas, Service Drives, Driveways, and Sidewalks: Replace with material equal to or better than existing or as indicated on Drawings. Conform to applicable requirements of sections referenced in Paragraph 2.01, Materials.

B. Street Pavements and Curbs, Curbs and Gutters: Replace subgrade, base, and surface course with like materials or as indicated on Drawings. Curbs and curbs and gutters shall match existing. Conform to requirements of sections referenced in Paragraph 2.01, Materials.

C. For concrete pavement, install size and length of reinforcing steel and pavement thickness indicated on Drawings. Place types and spacing of joints to match existing or as indicated on Drawings.

D. Where existing pavement consists of concrete pavement with asphaltic surfacing,

resurface with minimum 2 inch depth asphaltic pavement.

E. Repair state highway and county crossings in accordance with applicable permit or county requirements as appropriate and within 1 week after utility work is installed.

.03 WASTE MATERIAL DISPOSAL

A. Dispose of waste materials off site, in accordance with requirements of the Contract Documents.

.04 PROTECTION

A. Maintain pavement in good condition until completion of Work.

B. Replace pavement damaged by Contractor's operations at no cost to AW.

END OF SECTION

SECTION 03315

CONCRETE FOR UTILITY CONSTRUCTION

PART 1 G E N E R A L

.01 SECTION INCLUDES

A. Cast-in-place concrete work for utility construction or rehabilitation, such as slabs on grade, small vaults, site-cast bases for precast units, and in-place liners for manhole rehabilitation.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No payment will be made for concrete for utility construction under this Section. Include cost in applicable utility structure.
2. Obtain services of and pay for certified testing laboratory to prepare design mixes.
3. Refer to Special Provisions section of Contract Document for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ACI 117 - Standard Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACI 308 - Standard Practice for Curing Concrete.

F. ACI 309R - Guide for Consolidation of Concrete.

G. ACI 311 - Guide for Concrete Plant Inspection and Field Testing of Ready-Mix Concrete.

H. ACI 315 - Details and Detailing of Concrete Reinforcement.

I. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary.

J. ACI 544 - Guide for Specifying, Mixing, Placing, and Finishing Steel Fiber

Reinforced Concrete.

K. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

L. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

M. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

N. ASTM A 767 - Standard Specifications for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

O. ASTM A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

P. ASTM A 820 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

Q. ASTM A 884 - Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

R. ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

S. ASTM C 33 - Standard Specification for Concrete Aggregates.

T. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

U. ASTM C 42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

V. ASTM C 94 - Standard Specification for Ready-Mixed Concrete.

W. ASTM C 138 - Standard Test Method for Unit Weight Yield and Air Content (Gravimetric) of Concrete.

X. ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 - Standard Specification for Portland Cement.

Z. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.
03315-2

AA. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by Volumetric Method.

BB. ASTM C 231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

CC. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.

DD. ASTM C 309 - Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

EE. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

AF. ASTM C 595 - Standard Specification for Blended Hydraulic Cements.

FF. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

GG. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

HH. ASTM C 1077 - Standard Practice for Laboratory Testing of Concrete and Concrete Aggregate for Use in Construction and Criteria for Laboratory Evaluation.

II. CRSI MSP-1 - Manual of Standard Practice. AK. CRSI - Placing Reinforcing Bars.

JJ. Federal Specification SS-S-210A - Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

KK. NRMCA - Concrete Plant Standards.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit proposed mix design and test data for each type and strength of concrete in Work.

C. Submit laboratory reports prepared by independent testing laboratory stating that materials used comply with requirements of this Section.

D. Submit manufacturer's mill certificates for reinforcing steel. Provide specimens for testing when required by AW Project Manager.

E. Submit certification from concrete supplier that materials and equipment used to produce and deliver concrete comply with this Specification.

F. When required on Drawings, submit shop drawings showing reinforcement type, quantity, size, length, location, spacing, bending, splicing, support, fabrication details, and other pertinent information.

G. For waterstops, submit product information sufficient to indicate compliance with this Section, including manufacturer's descriptive literature and specifications.

.05 HANDLING AND STORAGE

A. Cement: Store cement off of ground in well-ventilated, weatherproof building.

B. Aggregate: Prevent mixture of foreign materials with aggregate and preserve gradation of aggregate.

C. Reinforcing Steel: Store reinforcing steel to protect it from mechanical injury and formation of rust. Protect epoxy-coated steel from damage to coating.

PART 2 PRODUCTS

.01 CONCRETE MATERIALS

A. Cementitious Material:

1. Portland Cement: ASTM C 150, Type H, unless use of Type III is authorized by AW Project Manager; or ASTM C 595, Type IP. For concrete in contact with sewage use Type H cement.
2. When aggregates are potentially reactive with alkalis in cement, use cement not exceeding 0.6 percent alkali content in form of $Na_20 + 0.658K_20$.

B. Water: Clean, free from harmful amounts of oils, acids, alkalis, or other deleterious substances, and meeting requirements of ASTM C 94.

C. Aggregate:

1. Coarse Aggregate: ASTM C 33. Unless otherwise indicated, use following ASTM standard sizes: No. 357 or No. 467; No. 57 or No. 67, No. 7. Maximum size: Not larger than 1/5 of narrowest dimension between sides of forms, nor larger than 3/4 of minimum clear spacing between reinforcing bars.
2. Fine Aggregate: ASTM C 33.
3. Determine potential reactivity of fine and coarse aggregate in accordance with Appendix to ASTM C 33.

D. Air Entraining Admixtures: ASTM C 260.

E. Chemical Admixtures:

1. Water Reducers: ASTM C 494, Type A.
2. Water Reducing Retarders: ASTM 494, Type D.
3. High Range Water Reducers (Superplasticizers): ASTM C 494, Types F and G.

F. Prohibited Admixtures: Admixtures containing calcium chloride, thiocyanate, or materials that contribute free chloride ions in excess of 0.1 percent by weight of cement.

G. Reinforcing Steel:

1. Use new billet steel bars conforming to ASTM A 615, ASTM A 767, or ASTM A 775, grade 40 or grade 60, as shown on Drawings. Use deformed bars except where smooth bars are specified. When placed in work, keep steel free of dirt, scale, loose or flaky rust, paint, oil or other harmful materials.
2. Where shown, use welded wire fabric with wire conforming to ASTM A 185 or ASTM A 884. Supply gauge and spacing shown, with longitudinal and transverse wires electrically welded together at points of intersection with welds strong enough not to be broken during handling or placing.
3. Wire: ASTM A 82. Use 16 1/2 gauge minimum for tie wire, unless otherwise

indicated.

H. Fiber:

1. Fibrillated Polypropylene Fiber:

   a. Addition Rate: 1.5 pounds of fiber per cubic yard of concrete.

   b. Physical Properties:

      1. Material: Polypropylene

      2. Length: 1/2 inch or graded

      3. Specific Gravity: 0.91

   c. Acceptable Manufacturer: W. R. Grace Company, Fibermesh, or approved equal.

2. Steel Fiber: Comply with applicable provisions of ACI 544 and ASTM A 820.

   a. Ratio: 50 to 200 pounds of fiber per cubic yard of concrete.

   b. Physical Properties

      1. Material: Steel

      2. Aspect Ratio (for fiber lengths of 0.5 to 2.5 inch, length divided by diameter or equivalent diameter): 30:1 to 100:1

      3. Specific Gravity: 7.8

      4. Tensile Strength: 40-400 ksi.

      5. Young's Modulus: 29,000 ksi

      6. Minimum Average Tensile Strength: 50,000 psi

      7. Bending Requirements: Withstand bending around 0.125-inch diameter mandrel to angle of 90 degrees, at temperatures not less than 60 degrees F, without breaking

I. Curing Compounds: Type 2 white-pigmented liquid membrane-forming compounds conforming to ASTM C 309.

.02 FORM WORK MATERIALS

A. Lumber and Plywood: Seasoned and of good quality, free from loose or unsound knots, knot holes, twists, shakes, decay and other imperfections which would affect strength or impair finished surface of concrete. Use S4S lumber for facing or sheathing. Forms for bottoms of caps: At least 2 inch (nominal) lumber or 3/4 inch form plywood backed adequately to prevent misalignment. For general use, provide lumber of 1-inch nominal thickness or form plywood of approved thickness.

B. Form work for Exposed Concrete Indicated to Receive Rubbed Finish: Form or form-lining surfaces free of irregularities; plywood of 1/4 inch minimum thickness, preferably oiled at mill.

C. Chamfer Strips and Similar Moldings: Redwood, cypress, or pine that will not split when nailed and which can be maintained to true line. Use mill-cut molding dressed on all faces.

D. Form Ties: Metal or fiberglass of approved type with tie holes not larger than 7/8 inch in diameter. Do not use wire ties or snap ties.

E. Metal Forms: Clean and in good condition, free from dents and rust, grease, or other foreign materials that tend to disfigure or discolor concrete in gauge and condition capable of supporting concrete and construction loads without significant distortion. Countersink bolt and rivet heads on facing sides. Use only metal forms which present smooth surface and which line up properly.

.03 PRODUCTION METHODS

A. Use either ready-mixed concrete conforming to requirements of ASTM C 94, or concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685.

.04 MEASUREMENT OF MATERIALS

A. Measure dry materials by weight, except volumetric proportioning may be used when concrete is batched and mixed in accordance with ASTM C 685.

B. Measure water and liquid admixtures by volume.

.05 DESIGN MIX

A. Use design mixes prepared by certified testing laboratory in accordance with ASTM C 1077 and conforming to requirements of this section.

B. Proportion concrete materials based on ACI 211.1 to comply with durability and strength requirements of ACI 318, Chapters 4 and 5, and this specification. Prepare mix design of Class A concrete so minimum cementitious content is 564 pounds per cubic yard. Submit concrete mix designs to AW Project Manager for review.

C. Proportioning on basis of field experience or trial mixtures in accordance with requirements at Section 5.3 of ACI 318 may be used, when approved by AW Project Manager.

D. Classification:

CLASS	TYPE	MINIMUM COMPRESSIVE STRENGTH (LBS/SQ. IN.)		MAXIMUM W/C RATIO	AIR CONTENT (PERCENT)	CONSISTENCY RANGE IN SLUMP (INCHES)
		7-DAY	28-DAY			
A	Structural	3200	4000	0.45	4 +/- 1	2 to 4*
B	Pipe Block Fill, Thrust Block	----	1500		4 +/- 1	5 to 7
*When ASTM C 494, Type F or Type G admixture is used to increase workability, this range may be 6 to 9.						

E. Add steel or polypropylene fibers only when called for on Drawings or in another section of these Specifications.

F. Determine air content in accordance with ASTM C 138, ASTM C 173 or ASTM C 231.

G. Use of Concrete Classes: Use classes of concrete as indicated on Drawings and other Specifications. Use Class B for unreinforced concrete used for plugging pipes, seal slabs, thrust blocks, trench dams, tunnel inverts and concrete fill unless indicated otherwise. Use Class A for all other applications.

.06 PVC WATERSTOPS

A. Extrude from virgin polyvinyl chloride elastomer. Use no reclaimed or scrap material. Submit waterstop manufacturer's current test reports and manufacturer's written certification that material furnished meets or exceeds Corps of Engineers Specification CRD-C572 and other specified requirements.

B. Flat Strip and Center-Bulb Waterstops:

1. Thickness: not less than 3/8 inch
2. Acceptable Manufacturers:
   a. Kirkhill Rubber Co., Brea, California
   b. Water Seals, Inc., Chicago, Illinois
   c. Progress Unlimited, Inc., New York, New York
   d. Greenstreak Plastic Products Co., St. Louis, Missouri
   e. Approved equal.

.07 RESILIENT WATERSTOP

A. Resilient Waterstop: Where shown on Drawings; either bentonite- or adhesive-type material.

B. Bentonite Waterstop:

1. Material: 75 percent bentonite, mixed with butyl rubber-hydrocarbon containing less than 1.0 percent volatile matter, and free of asbestos fibers or asphaltics.
2. Manufacturer's rated temperature ranges: For application, 5 to 125 degrees F; in service, -40 to 212 degrees F.
3. Cross-sectional dimensions, unexpanded waterstop: 1 inch by 3/4 inch
4. Provide with adhesive backing capable of producing excellent adhesion to concrete surfaces.

C. Adhesive Waterstop:

1. Preformed plastic adhesive waterstop at least 2 inches in diameter.
2. Meets or exceeds requirements of Federal Specification SS-S-210A.
3. Supplied wrapped completely by 2 part protective paper.
4. Submit independent laboratory tests verifying that material seals joints in concrete against leakage when subjected to minimum of 30 psi water pressure for at least 72 hours.
5. Provide primer, to be used on hardened concrete surfaces, from same manufacturer who supplies waterstop material.
6. Acceptable Manufacturer: Synko-Flex Preformed Plastic Adhesive Waterstop, Synko-Flex Products, Inc.; or approved equal.

PART 3 EXECUTION

.01 FORMS AND SHORING

A. Provide mortar-tight forms sufficient in strength to prevent bulging between supports. Set and maintain forms to lines designated such that finished dimensions of structures are within tolerances specified in ACI 117. Construct forms to permit removal without damage to concrete. Forms may be given slight draft to permit ease of removal. Provide adequate clean out openings. Before placing concrete, remove extraneous matter from within forms.

B. Install rigid shoring having no excessive settlement or deformation. Use sound timber in shoring centering. Shim to adjust and tighten shoring with hardwood timber wedges.

C. Design Loads for Horizontal Surfaces of Forms and Shoring: Minimum fluid pressure, 175 pounds per cubic foot; live load, 50 pounds per square foot. Maximum unit stresses: 125 percent of allowable stresses used for form materials and for design of support structures.

D. Back form work with sufficient number of studs and wales to prevent deflection.

E. Re-oil or lacquer liner on job before using. Facing may be constructed of 3/4 inch plywood made with waterproof adhesive backed by adequate studs and

wales. In such cases, form lining will not be required.

F. Unless otherwise indicated, form outside corners and edges with triangular 3/4 inch chamfer strips (measured on sides).

G. Remove metal form ties to depth of at least 3/4 inch from surface of concrete. Do not burn off ties. Do not use pipe spreaders. Remove spreaders which are separate from forms as concrete is being placed.

H. Treat facing of forms with approved form coating before concrete is placed. When directed by AW Project Manager, treat both sides of face forms with coating. Apply coating before reinforcement is placed. Immediately before concrete is placed, wet surface of forms which will come in contact with concrete.

.02 PLACING REINFORCEMENT

A. Place reinforcing steel accurately in accordance with approved Drawings. Secure steel adequately in position in forms to prevent misalignment. Maintain reinforcing steel in place using approved concrete and hot-dip galvanized metal chairs and spacers. Place reinforcing steel in accordance with CRSI Publication "Placing Reinforcing Bars." Request inspection of reinforcing steel by Project Manager and obtain acceptance before concrete is placed.

B. Minimum spacing center-to-center of parallel bars: 2 1/2 times nominal bar diameter. Minimum cover measured from surface of concrete to face of reinforcing bar unless shown otherwise on Drawings: 3 inches for surfaces cast against soil or subgrade, 2 inches for other surfaces.

C. Detail bars in accordance with ACI 315. Fabricate reinforcing steel in accordance with CRSI Publication MSP-1, "Manual of Standard Practice." Bend reinforcing steel to required shape while steel is cold. Excessive irregularities in bending will be cause for rejection.

D. Do not splice bars without written approval of Project Manager. Approved bar bending schedules or placing drawings constitute written approval. Splice and development length of bars shall conform to ACI 318, Chapters 7 and 12, and as shown on Drawings. Stagger splices or locate at points of low tensile stress.

.03 EMBEDDED ITEMS

A. Install conduit and piping as shown on Drawings. Accurately locate and securely fasten conduit, piping, and other embedded items in forms.

B. Install waterstops as specified in other sections and according to manufacturer's instructions. Securely position waterstops at joints as indicated on Drawings. Protect waterstops from damage or displacement during concrete placing operations.

.04 BATCHING, MIXING AND DELIVERY OF CONCRETE

A. Measure, batch, mix, and deliver ready-mixed concrete in accordance with ASTM C 94, Sections 8 through 11. Produce ready-mixed concrete using automatic batching system as described in NRMCA Concrete Plant Standards, Part 2 - Plant Control Systems.

B. Measure, mix and deliver concrete produced by volumetric batching and continuous mixing in accordance with ASTM C 685, Sections 6 though 8.

C. Maintain concrete workability without segregation of material and excessive bleeding. Obtain approval of Project Manager before adjustment and change of mix proportions.

D. Ready-mixed concrete delivered to site shall be accompanied by batch tickets providing information required by ASTM C 94, Section 16. Concrete produced by continuous mixing shall be accompanied by batch tickets providing information required by ASTM C 685, Section 14.

E. When adverse weather conditions affect quality of concrete, postpone concrete placement. Do not mix concrete when air temperature is at or below 40 degrees F and falling. Concrete may be mixed when temperature is 35 degrees F and rising. Take temperature readings in shade, away from artificial heat. Protect concrete from temperatures below 32 degrees F until concrete has cured for minimum of 3 days at 70 degrees F or 5 days at 50 degrees F.

F. Clean, maintain and operate equipment so that it thoroughly mixes material as required.

G. Hand-mix only when approved by AW Project Manager.

.05 PLACING CONCRETE

A. Give sufficient advance notice to AW Project Manager (at least 24 hours prior to commencement of operations) to permit inspection of forms, reinforcing steel, embedded items and other preparations for placing concrete. Place no concrete prior to AW Project Manager's approval.

B. Schedule concrete placing to permit completion of finishing operations in daylight hours. However, when necessary to continue after daylight hours, light site as required. When rainfall occurs after placing operations are started, provide covering to protect work.

C. Use troughs, pipes and chutes lined with approved metal or synthetic material in placing concrete so that concrete ingredients are not separated. Keep chutes, troughs and pipes clean and free from coatings of hardened concrete. Allow no aluminum material to be in contact with concrete.

D. Limit free fall of concrete to 4 feet. Do not deposit large quantities of concrete at one location so that running or working concrete along forms is required. Do not jar forms after concrete has taken initial set; do not place strain on projecting

reinforcement or anchor bolts.

E. Use tremies for placing concrete in walls and similar narrow or restricted locations. Use tremies made in sections, or provide in several lengths, so that outlet may be adjusted to proper height during placing operations.

F. Place concrete in continuous horizontal layers approximately 12 inches thick. Place each layer while layer below is still plastic.

G. Compact each layer of concrete with concrete spading implements and mechanical vibrators of approved type and adequate number for size of placement. When immersion vibrators cannot be used, use form vibrators. Apply vibrators to concrete immediately after depositing. Move vibrator vertically through layer of concrete just placed and several inches into plastic layer below. Do not penetrate or disturb layers previously placed which have partially set. Do not use vibrators to aid lateral flow concrete. Closely supervise consolidation to ensure uniform insertion and duration of immersion.

H. Handling and Placing Concrete: Conform to ACI 302.1R, ACI 304R and ACI 309R.

.06 WATERSTOPS

A. Embed waterstops in concrete across joints as shown. Waterstops shall be continuous for extent of joint; make splices necessary to provide continuity in accordance with manufacturer's instructions. Support and protect waterstops during construction operations; repair or replace waterstops damaged during construction.

B. Install waterstops in concrete on one side of joints, leaving other side exposed until next pour. When waterstop will remain exposed for 2 days or more, shade and protect exposed waterstop from direct rays of sun during entire exposure and until exposed portion of waterstop is embedded in concrete.

C. Splicing PVC Waterstops:

1. Splice waterstops by heat-sealing adjacent waterstop sections in accordance with manufacturer's printed instructions.

2. Butt end-to-end joints of two identical waterstop sections may be made in forms during placement of waterstop material.

3. Prior to placement in form work, prefabricate waterstop joints involving more than two ends to be joined together, angle cut, alignment change, or joining of two dissimilar waterstop sections, allowing not less than 24 inch long strips of waterstop material beyond joint. Upon inspection and approval by Project Manager, install prefabricated waterstop joint assemblies in form work, and butt-weld ends of 24 inch strips to straight-run portions of waterstop in forms.

D. Setting PVC Waterstops:

1. Correctly position waterstops during installation. Support and anchor waterstops

during progress of work to ensure proper embedment in concrete and to prevent folding over of waterstop by concrete placement. Locate symmetrical halves of waterstops equally between concrete pours at joints, with center axis coincident with joint openings. Thoroughly work concrete in joint vicinity for maximum density and imperviousness.

2. Where waterstop in a vertical wall joint does not connect with any other waterstop, and is not intended to be connected to waterstop in future concrete placement, terminate waterstop 6 inches below top of wall.

E. Replacement of Defective Field Joints: Replace waterstop field joints showing evidence of misalignment, offset, porosity, cracks, bubbles, inadequate bond or other defects with products and joints complying with Specifications.

F. Resilient Waterstop:

1. Install resilient waterstop in accordance with manufacturer's instructions and recommendations.
2. When requested by AW Project Manager, provide technical assistance by manufacturer's representative in field at no additional cost to AW.
3. Use resilient waterstop only where complete confinement by concrete is provided; do not use in expansion or contraction joints.
4. Where resilient waterstop is used in combination with PVC waterstop, lap resilient waterstop over PVC waterstop minimum of 6 inches and place in contact with PVC waterstop. Where crossing PVC at right angles, melt PVC ribs to form smooth joining surface.
5. At free top of walls without connecting slabs, stop resilient waterstop and grooves (where used) 6 inches from top in vertical wall joints.
6. Bentonite Waterstop:
    a. Locate bentonite waterstop as near as possible to center of joint and extend continuous around entire joint. Minimum distance from edge of waterstop to face of member: 5 inches.
    b. Where thickness of concrete member to be placed on bentonite waterstop is less than 12 inches, place waterstop in grooves at least 3/4 inch deep and 1 1/4 inches wide formed or ground into concrete. Minimum distance from edge of waterstop placed in groove to face of member: 2.5 inches.
    c. Do not place bentonite waterstop when waterstop material temperature is below 40 degrees F. Waterstop material may be warmed so that it remains above 40 degrees F during placement but means used to warm it shall in no way harm material or its properties. Do not install waterstop where air temperature falls outside manufacturer's recommended range.
    d. Place bentonite waterstop only on smooth and uniform surfaces; grind concrete smooth when necessary to produce satisfactory

substrate, or bond waterstop to irregular surfaces using epoxy grout which completely fills voids and irregularities beneath waterstop material. Prior to installation, wire brush concrete surface to remove laitance and other substances that may interfere with bonding of epoxy.

e. In addition to adhesive backing provided with waterstop, secure bentonite waterstop in place with concrete nails and washers at 12 inch maximum spacing.

7. Adhesive Waterstop:

a. With wire brush thoroughly clean concrete surface on which waterstop is to be placed and then coat with primer.

b. If surface is too rough to allow waterstop to form complete contact, grind to form adequately smooth surface.

c. Install waterstop with top protective paper left in place. Overlap joints between strips minimum of 1 inch and cover back over with protective paper.

d. Do not remove protective paper until just before final form work completion. Place concrete immediately. Time that waterstop material is uncovered prior to concrete placement shall be minimized and shall not exceed 24 hours.

.07 CONSTRUCTION JOINTS

A. Definitions:

1. Construction joint: Contact surface between plastic (fresh) concrete and concrete that has attained initial set.

2. Monolithic: Manner of concrete placement to reduce or eliminate construction joints; joints other than those indicated on Drawings will not be permitted without written approval of Project Manager. Where so approved, make additional construction joints with details equivalent to those indicated for joints in similar locations.

3. Preparation for Construction Joints: Roughen surface of concrete previously placed, leaving some aggregate particles exposed. Remove laitance and loose materials by sandblasting or high-pressure water blasting. Keep surface wet for several hours prior to placing of plastic concrete.

.08 CURING

A. Comply with ACI 308. Cure by preventing loss of moisture, rapid temperature change and mechanical injury for period of 7 curing days when Type II or IP cement has been used and for 3 curing days when Type III cement has been used. Start curing as soon as free water has disappeared from concrete surface

after placing and finishing. A curing day is any calendar day in which temperature is above 50 degrees F for at least 19 hours. Colder days may be counted when air temperature adjacent to concrete is maintained above 50 degrees F. In continued cold weather, when artificial heat is not provided, removal of forms and shoring may be permitted at end of calendar days equal to twice required number of curing days. However, leave soffit forms and shores in place until concrete has reached specified 28 day strength, unless directed otherwise by Project Manager.

B. Cure formed surfaces not requiring rubbed-finished surface by leaving forms in place for full curing period. Keep wood forms wet during curing period. Add water as needed for other types of forms. Or, at Contractor's option, forms may be removed after 2 days and curing compound applied.

C. Rubbed Finish:

1. At formed surfaces requiring rubbed finish, remove forms as soon as practicable without damaging surface.

2. After rubbed-finish operations are complete, continue curing formed surfaces by using either approved curing/sealing compounds or moist cotton mats until normal curing period is complete.

D. Unformed Surfaces: Cure by membrane curing compound method.

1. After concrete has received final finish and surplus water sheen has disappeared, immediately seal surface with uniform coating of approved curing compound, applied at rate of coverage recommended by manufacturer or as directed by AW Project Manager. Do not apply less than 1 gallon per 180 square feet of area. Provide satisfactory means to properly control and check rate of application of compound.

2. Thoroughly agitate compound during use and apply by means of approved mechanical power pressure sprayers equipped with atomizing nozzles. For application on small miscellaneous items, hand-powered spray equipment may be used. Prevent loss of compound between nozzle and concrete surface during spraying operations.

3. Do not apply compound to dry surface. When concrete surface has become dry, thoroughly moisten surface immediately prior to application. At locations where coating shows discontinuities, pinholes or other defects, or when rain falls on newly coated surface before film has dried sufficiently to resist damage, apply additional coat of compound at specified rate of coverage.

.09 REMOVAL OF FORMS AND SHORING

A. Remove forms from surfaces requiring rubbing only as rapidly as rubbing operation progresses. Remove forms from vertical surfaces not requiring rubbed-finish when concrete has aged for required number of curing days. When curing compound is used, do not remove forms before 2 days after concrete

placement.

B. Leave soffit forms and shores in place until concrete has reached specified 28-day strength, unless directed otherwise by Project Manager.

.010 DEFECTIVE WORK

A. Immediately repair defective work discovered after forms have been removed. When concrete surface is bulged, uneven, or shows excess honeycombing or form marks which cannot be repaired satisfactorily through patching, remove and replace entire section.

.011 FINISHING

A. Patch honeycomb, minor defects and form tie holes in concrete surfaces with cement mortar mixed one part cement to two parts fine aggregate. Repair defects by cutting out unsatisfactory material and replacing with new concrete, securely keyed and bonded to existing concrete. Finish to make junctures between patches and existing concrete as inconspicuous as possible. Use stiff mixture and thoroughly tamp into place. After each patch has stiffened sufficiently to allow for greatest portion of shrinkage, strike off mortar flush with surface.

B. Apply rubbed finish to exposed surfaces of formed concrete structures as noted on Drawings. After pointing has set sufficiently, wet surface with brush and perform first surface rubbing with No. 16 carborundum stone, or approved equal. Rub sufficiently to bring surface to paste, to remove form marks and projections, and to produce smooth, dense surface. Add cement to form surface paste as necessary. Spread or brush material, which has been ground to paste, uniformly over surface and allow to reset. In preparation for final acceptance, clean surfaces and perform final finish rubbing with No. 30 carborundum stone or approved equal. After rubbing, allow paste on surface to reset; then wash surface with clean water. Leave structure with clean, neat and uniform-appearing finish.

C. Apply wood float finish to concrete slabs.

.012 FIELD QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, AW may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. Unless otherwise directed by AW Project Manager, following minimum testing of concrete is required. Testing shall be performed by qualified individuals employed by approved independent testing agency, and conform to requirements

of ASTM C 1077.

1. Take concrete samples in accordance with ASTM C 172.
2. Make one set of four compression test specimens for each mix design at least once per day and for each 150 cubic yards or fraction thereof. Make, cure and test specimens in accordance with ASTM C 31 and ASTM C 39.
3. When taking compression test specimens, test each sample for slump according to ASTM C 143, for temperature according to ASTM C 1064, for air content according to ASTM C 231, and for unit weight according to ASTM C 138.
4. Inspect, sample and test concrete in accordance with ASTM C 94, Section 13, 14, and 15, and ACI 311-5R.

C. Test Cores: Conform to ASTM C 42.

D. Testing High Early Strength Concrete: When Type III cement is used in concrete, specified 7 day and 28 day compressive strengths shall be applicable at 3 and 7 days, respectively.

E. If 7-day or 3-day test strengths (as applicable for type of cement being used) fail to meet established strength requirements, extended curing or resumed curing on those portions of structure represented by test specimens may be required. When additional curing fails to produce required strength, strengthening or replacement of portions of structure which fail to develop required strength may be required by AW Project Manager, at no additional cost to AW.

.013 PROTECTION

A. Protect concrete against damage until final acceptance by AW.

B. Protect fresh concrete from damage due to rain, hail, sleet, or snow. Provide protection while concrete is still plastic, and whenever precipitation is imminent or occurring.

C. Do not backfill around concrete structures or subject them to design loadings until components of structure needed to resist loading are complete and have reached specified 28 day compressive strength, except as authorized otherwise by AW Project Manager.

END OF SECTION

SECTION 04061

MORTAR

PART 1 GENERAL

.01 SECTION INCLUDES

A. Mortar and grout for masonry.

.02 MEASUREMENT AND PAYMENT

A. Unit Prices.

1. No separate payment will be made for mortar under this Section. Include payment in Lump Sum for building or structure with price breakdown included in Schedule of Prices.
2. Refer to Special Provisions section of Contract Document for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

.03 REFERENCES

A. ASTM C 143 - Standard Testing Method for Slump of Hydraulic Cement Concrete

B. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.

C. ASTM C 150 - Standard Specification for Portland Cement.

D. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.

E. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.

F. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout.

G. ASTM C 476 - Standard Specification for Grout for Masonry.

H. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

I. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Include design mix, indicate Property Method used, required environmental conditions, and admixture limitations.

C. Samples: Submit two ribbons of each mortar color, illustrating color and color range.

D. Submit two copies of test reports.

E. Submit test reports on mortar indicating conformance to ASTM C 270.

F. Submit test reports on grout indicating conformance to ASTM C 476.

G. Submit manufacturer's certificate, that products meet or exceed specified requirements.

.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperatures to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

.07 MIX TESTS

A. Test mortar and grout.

B. Testing of Mortar Mix: Test in accordance with ASTM C 780. Test mortar mix for compressive strength, consistency, mortar aggregate ratio, water content, air content, and splitting tensile strength.

C. Testing of Grout Mix: Test in accordance with ASTM C 109. Test grout mix for compressive strength and slump.

PART 2 PRODUCTS

.01 MATERIALS

A. Portland Cement: ASTM C 150, Type I, white color.

B. Masonry Cement: Not permitted.

C. Mortar Aggregate: ASTM C 144, standard masonry type. Grading and color suitable for type of masonry, one source for entire project. (Not less than 5 percent shall pass No. 100 sieve).

D. Hydrated Lime: ASTM C 207, Type S.

E. Grout Aggregate: ASTM C 404.

F. Water: Clean and potable.

.02 MORTAR COLOR

A. Mortar Color: Mineral oxide pigment; color; to be selected by AW Project Manager from manufacturer's samples.

.03 ADMIXTURES

A. Antifreeze: Antifreeze admixtures will not be permitted.

B. Accelerator: Accelerator may be used only with approval of AW Project Manager.

.04 MORTAR

A. Mortar for Load Bearing Walls and Partitions: ASTM C 270, Type S utilizing Property Method to achieve 1800 psi strength.

B. Mortar for Non-load Bearing Walls and Partitions: ASTM C 270, Type S utilizing the Property Method to achieve 1800 psi strength.

C. Mortar for Masonry Below Grade or in Contact with Earth: ASTM C 270, Type M utilizing the Property Method to achieve 2500 psi strength.

D. Pointing Mortar: ASTM C 270, Type N, using the Property Method to achieve 750 psi strength.

.05 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C 270 to achieve strengths noted in Paragraph 2.04.

B. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

C. Do not use anti-freeze compounds to lower freezing point of mortar.

D. If water is lost by evaporation, retemper only within 2 hours of mixing.

E. Use mortar within 2 hours after mixing at temperatures of 80 degrees F, or 2 1/2 hours at temperatures under 50 degrees F.

.06 GROUT

A. Bond Beams, Lintels, and Other Areas to be Grouted Solid: 3000 psi strength at 28 days; 7 to 8 inches slump per ASTM C 143; mixed in accordance with ASTM C 476, Fine Grout.

.07 GROUT MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C 476, Fine Grout.

B. Add admixtures in accordance with manufacturer's instructions. Provide

uniformity of mix.

C. Do not use anti-freeze compounds to lower freezing point of grout.

PART 3 EXECUTION

.01 EXAMINATION

A. Request inspection of spaces to be grouted.

.02 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean out holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

.03 INSTALLATION

A. Install mortar and grout in accordance with manufacturer's instructions.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove grout spaces of excess mortar.

END OF SECTION

SECTION 04210

BRICK MASONRY FOR UTILITY CONSTRUCTION

PART 1 GENERAL

.01 SECTION INCLUDES

A. Brick masonry work in utility construction for permanent or temporary installation of below ground structures.

B. Brick masonry in repair and rehabilitation of utility lines and associated structures.

.02 UNIT PRICES

A. No payment will be made for brick masonry under this Section unless specifically noted in bid documents. Include payment in unit price for applicable utility structure section.

.03 REFERENCES

A. ASTM C 32 - Specification for Sewer and Manhole Brick (Made from Clay or Shale).

B. ASTM C 55 - Standard Specification for Concrete Building Brick.

C. ASTM C 62 - Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).

D. ASTM C 67 - Methods of Sampling and Testing Brick and Structural Clay Tile.

E. ASTM C 91 - Specification for Masonry Cement.

F. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).

G. ASTM C 140 - Standard Method of Sampling and Testing Concrete Masonry Units.

H. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.

.04 SUBMITTALS

A. Conform to requirements of Section 01300 - Submittal Procedures.

B. Submit certification from the manufacturer that brick units meet applicable requirements of reference standards.

C. As an alternate to providing certification, submit test results that show brick units meet applicable requirements of reference standards, when tested by

an approved independent testing laboratory. Test result submittals shall be at no cost to AW.

.05 HANDLING AND STORAGE

A. Handle and store brick to prevent damage.

B. Store brick and mortar mix off the ground and in a dry place. Cover mortar mix to protect from weather.

PART 2 PRODUCTS

.01 CLAY AND SHALE BRICK MASONRY UNITS

A. Manholes and Structures: Use brick units made from clay or shale conforming to requirements of ASTM C 32, Grade MM, either cored or solid. Units shall have the following physical properties:

1. Compressive Strength: 2200 psi minimum for individual brick; 2500 psi average for five bricks.
2. Size: 2-1/4" by 7-5/8" by 3-5/8".
3. Test Procedure: ASTM C 67.

B. Sewer Brick: Use brick units made from clay or shale conforming to requirements of ASTM C 32, Grade SM, either cored or solid. Units shall have the following physical properties:

1. Compressive Strength: 3750 psi minimum for individual brick; 5000 psi average for 5 bricks.
2. Size: 2-1/4" by 7-5/8" by 3-5/8".
3. Test Procedure: ASTM C 67.

.02 CONCRETE BRICK MASONRY UNITS

A. Manholes and Structures: Conform to requirements of ASTM C 55, grade S-1.

B. Dimensions: 2-1/4" by 7-5/8" by 3-5/8".

.03 MORTAR

A. Provided mortar conforming to the requirements of Section 4061 - Mortar.

PART 3 EXECUTION

.01 EXAMINATION

A. Ensure that foundations and other surfaces to support brickwork are at proper grades and elevations. Correct improperly prepared surfaces. Work surfaces and

masonry shall be free of dirt, grease, oil, or other harmful materials before starting brick masonry work.

.02 WEATHER REQUIREMENTS

A. Lay no masonry when temperature of outside air is below 50 degrees F, unless satisfactory means are provided to heat materials and protect work from cold and frost.

B. Maintain mortar at 50 degrees F or above and ensure that mortar will harden without freezing.

.03 BRICK PLACEMENT

A. Use sewer brick where exposed to flow. Where not exposed to flow, use manhole brick.

B. Lay sewer brick with the 2-1/4" by 7-5/8" side exposed to flow.

C. Lay manhole bricks so that in every fifth course the long axis of bricks are perpendicular to the long axis of the four preceding courses.

D. Lay curved courses, and courses in different planes, using bonded and keyed construction.

E. Lay brick plumb and true with courses level and uniformly spaced. Adjust the bond of face brick so that no course will terminate with a piece less than one-half length of brick.

F. Dampen brick prior to placement.

G. Where fresh masonry joins partially set or totally set masonry, clean surfaces of set masonry. Remove loose mortar and brick. Wet brick to obtain the best possible bond.

H. Immediately remove mortar droppings and splashing as work progresses to facilitate final cleaning.

.04 JOINTS

A. Completely fill joints in brick and other materials with mortar as each course is laid.

B. Make joints in exposed brickwork a uniform 3/8-inch wide, unless otherwise shown on Drawings.

C. When mortar is "thumbprint" hard, tool exposed joints with a round or other suitable jointer that is slightly larger than width of the mortar joint. In tooling, make sure that cracks and crevices are closed.

D. Point holes in exposed masonry. Cut out defective joints and repoint.

.05 FIELD QUALITY CONTROL

A. The Contractor will retain and will be required to conduct random performance testing to the requirements as outlined below, using an independent Testing Laboratory Services firm so qualified conduct the necessary testing. The designated Testing Laboratory Services firm to be approved by AW Project Manager. In addition, AW may elect to retain their own Testing Company to qualify/substantiate the findings/results of the Testing Firm retained by the Contractor.

B. A minimum of one set of mortar samples shall be molded for each day's placement as directed by AW Project Manager. Mold three 2-inch cube specimens. One cube will be tested for compressive strength at 7 days and 2 cubes will be tested for compressive strength at 28 days in accordance with ASTM C 109.

C. Each load of bricks delivered to the jobsite shall be tested.

1. Test clay bricks in accordance with ASTM C 167.
2. Test concrete bricks in accordance with ASTM C 140.

END OF SECTION

Appendix FF

Oklahoma Natural Gas (ONG) - Requirements

OKLAHOMA NATURAL GAS
A DIVISION OF ONEOK

NEW SERVICE LINE POLICY EXPLANATION

FORM 1931

New rules approved by the Oklahoma Corporation Commission allow Oklahoma Natural Gas Company (ONG) to put the natural gas meter next to your house and to install the natural gas piping between the property line and your house. The following is a summary of your options and rights and responsibilities, as well as those of ONG.

ONG will:

1. Discuss your options with you and work out a mutually agreeable location for the meter near the outside wall of the first building to be served.
2. Install a service line, at ONG's cost up to a maximum allowable investment based on anticipated revenue, under normal conditions. This includes installations of service to new homes, replacement of deteriorated yard lines, and replacement of lines damaged during excavation, provided prudent care was taken during such excavation.
3. Locate distribution mains and service lines, upon request, beginning January 1, 2001.
4. Perform periodic main and service line leakage surveys according to ONG policy.
5. Inspect and test ONG's piping system, as well as your piping system, for leakage or other purposes as necessary.
6. Repair any leaks on our service line and meter and replace them when necessary.
7. Make reasonable efforts to restore your yard, but ONG cannot be responsible for normal construction damages.

You, the owner, will:

1. Provide a suitable location for the meter, away from potential hazards.
2. Grant ONG reasonable access to your property to install the service line and meter and to perform maintenance and repair.
3. Be responsible for any extraordinary construction costs, such as replacing pavement, patios, and decks, modifying your house piping to meet local building codes, excavating in hard rock or frozen ground, installing footage of service line, or installing a service line greater than 1-1/4" diameter.
4. Be responsible for any additional lines to gas grills, gas lights, additional buildings, etc., as well as for any yard line you might need to install between the meter and your home.
5. Advise ONG if there are any changes on, or to, your property, that might place the meter in a potentially hazardous situation.
6. Notify ONG prior to building any permanent structures over the service line.
7. Be required to pay for any relocation of ONG's service line or meter due to your construction.
8. Refrain from enclosing the meter or any portion of ONG's aboveground piping.

YOU MAY REQUEST AN ALTERNATE METER LOCATION AWAY FROM THE BUILDING. You will, however, be responsible for the installation and maintenance of the line from the meter to the building. ONG will still respond to requests to locate your yard line and perform leakage surveys on the line.

Our goal is to provide you with safe, reliable gas service. Please call if I can be of further service.

ONG Representative _____

Phone Number _____

LINE EXTENSION DATA SHEET - FORT SILL

JOB ORDER NO./ ESTIMATE NO.

Ft Sill P/N

Main | Main & Services | Services Only

DATE OF APPLICATION

DATE REQUIRED

REMARKS OR SPECIAL REQUESTS? [ ] NO [x] YES (See Remarks Below)

LEGAL DESCRIPTION

DRAWING ATTACHED

ATLAS PAGE NO.

WALL MAP NO.

THIS JOB WILL SERVE THE FOLLOWING LOCATION:

REMARKS

REQUESTING ORGANIZATION

P.O.C.

CONTACT INFORMATION

METER LOCATION

PROJECTED LIFE OF PROJECT

RESIDENTIAL / COMMERCIAL/INDUSTRIAL			Monthly Flat Rate	REVENUE
RESIDENTIAL	Number of Meters	0	$21.70	$0.00
COMMERCIAL 201	Number of Meters	0	$113.23	$0.00
COMMERCIAL 202	Number of Meters	0	$31.61	$0.00
INDUSTRIAL	Number of Meters	0	$238.11	$0.00
		TOTAL		$0.00

FITTINGS	QT	COST	TOTAL	LABOR AND EQUIP.	UNIT	RATE	TOTAL	METER INSTALL	UNIT	COST
Excess Flow Valve	0	$0.00	$0.00	Labor (Hrs)	0	$0.00	$0.00	250	0	$0.00
Tapping Tee 2 X 3/4"	0	$0.00	$0.00	GP 4	0	$0.00	$0.00	425	0	$0.00
HV Tapping Tee 2 X 2"	0	$0.00	$0.00	GP 6	0	$0.00	$0.00	630	0	$0.00
HV Tapping Tee 4 X 2"	0	$0.00	$0.00	2/Ton with Trailer	0	$0.00	$0.00	800	0	$0.00
Pipe 3/4"	0	$0.00	$0.00	Backhoe	0	$0.00	$0.00	1.5 M	0	$0.00
Pipe 2"	0	$0.00	$0.00	Other	0	$17.00	$0.00	3 M	0	$0.00
Other	0		$0.00	Other	0	$18.00	$0.00	5 M	0	$0.00
Other	0		$0.00	Other	0	$19.00	$0.00	7 M	0	$0.00
Other	0		$0.00	Other	0	$20.00	$0.00	11 M	0	$0.00
Other	0		$0.00	Other	0	$21.00	$0.00	Other	0	$0.00
TOTAL			$0.00	TOTAL			$0.00	TOTAL		$0.00

*Note: All calculations are estimated. Customer Co-Payment will be based actual costs incurred by Contractor.

INSTALLATION COST (Main line, service lines, and metering)	$0.00
MAXIMUM ALLOWABLE INVESTMENT BY CONTRACTOR	$0.00
CUSTOMER CO-PAYMENT	$0.00

Oklahoma Natural Gas (Contractor) and Fort Sill Army Post (Government) understand and agree that
1. Government has received and read a copy of the company's New Service Line Policy Explanation, which explains the Contractor's and Government's rights and responsibilities regarding ownership, maintenance, ar repair of service lines and meters

2.Government agrees to provide Contractor appropriate access to Government premises for the purpose of installing, maintaining and repairing service lines and meter

3.The company will install measurement equipment at a suitable site on the Government's premise, which normall will be located at the building wall, but may be located at another mutually agreedupon site. Government a Contractor agree that the measurement equipment shall be located at site listed abov

Authorizing Agent: _____ _____ Date _____
Signature

Contractor Representative: _____ _____ Date _____
Signature

SERVICE LINE COST AND AGREEMENT

FORM 1930 (2/2004)

SERVICE ADDRESS		ACCOUNT NO.
TENANT NAME	DAY PHONE	EVENING PHONE
OWNER NAME	DAY PHONE	EVENING PHONE
BILLING ADDRESS — STREET ADDRESS		
BILLING ADDRESS — CITY/STATE/ZIP CODE		

COST CALCULATION

Total Length:		Ft.	**SERVICE LINE COST**			ONG Labor / Materials	$0.00
Home Size		Sq. Feet	Labor (Manhours)	0	Hours	Concrete Cut	$0.00
Heating Only		☐	Pick-Up, Group 4	0	Hours	Other	$0.00
Heat & Water Heat		☐	Pick-Up, Group 6	0	Hours	Other	$0.00
Heat, Water, & Cooking		☐	2-Ton w/Trailer	0	Hours	Other	$0.00
Electric Heat Pump / Gas Backup		☐	Backhoe	0	Hours	Other	$0.00
Other	100	Dth ☐	Pipe - 1/2"	0	Feet	Other	$0.00
			Pipe - 3/4"	0	Feet	Other	$0.00
COMMERCIAL LOAD		☐	Pipe - 1 1/4"	0	Feet	Other	$0.00
Total Load Dth/Hr	1.500		Pipe - 2"	0	Feet	Other	$0.00
Max Daily (MDQ)	15.00		Pipe - 4"	0	Feet	Other	$0.00
Total Annual Dth	1,500					**CONSTRUCTION COST**	$0.00
Number of Meters	0		**METER INSTALLED COST**			**LESS ALLOWABLE REVENUE CREDIT**	$424.73
			Meter - 250	0		**PLUS CREDIT**	$300.00
FITTINGS			Meter - AL 425	0		**LIHEAP QUALIFIED Yes** ☐	$0.00
Excess Flow Valves (EFV)	0		Meter - AL 800	0		**TOTAL OWNER COST****	$0.00
Tapping Tee 2" x 3/4"	0		Meter - AL 1000	0		**LESS PAYMENT RECEIVED**	$0.00
Tapping Tee 4" x 3/4"	0		Meter - 3M	0		**REMAINING BALANCE**	$0.00
Tee, Service, Trans 1"x3/4"	0		Meter - 5M	0			

* An experienced construction employee should estimate extraordinary construction barriers or pipe size requirements larger than 1 1/4 inch.

FINANCE AGREEMENT

** If the Total Owner cost exceeds $300.00, the owner may make a downpayment of $100.00, and pay the remaining balance in installments for a period not to exceed 12 months. The monthly installments shall be equal to the greater of 1/12 of the remaining balance owed or $50.00. If owner pays less than the Total Owner Cost at the time of signing this agreement, owner shall be deemed to have elected the monthly payment option. Any payment obligation will be added to owner's gas bill.

SERVICE LINE AGREEMENT

The undersigned property owner ("Owner"), _____ has authorized Oklahoma Natural Gas Company ("Company") to install a service line or replace the Owner's existing service line and/or yardline and to place the gas measurement equipment on the Owner's property.

The Company and the Owner understand and agree that:

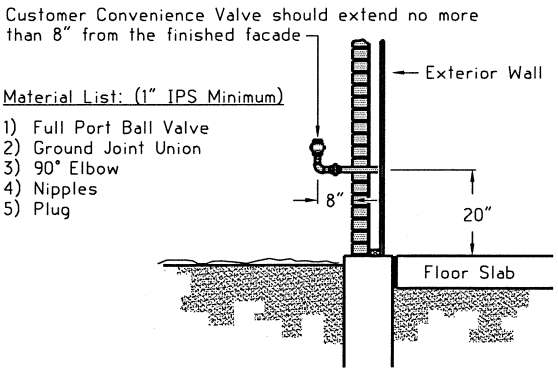
1. Owner has received and read a copy of the Company's New Service Line Policy Explanation, which explains the Company's and Owner's rights and responsibilities regarding ownership, maintenance, and repair of service lines and meters.
2. Owner agrees to provide the Company appropriate access to Owner's premises for the purpose of installing, maintaining, and/or repairing service lines and meters.
3. The Company will install measurement equipment at a suitable site on the Customer's premise, which normally will be located at the building wall, but may be located at another mutually agreed-upon site. Owner and Company agree that the measurement equipment shall be located at the following location:

LOCATION DESCRIPTION: _____

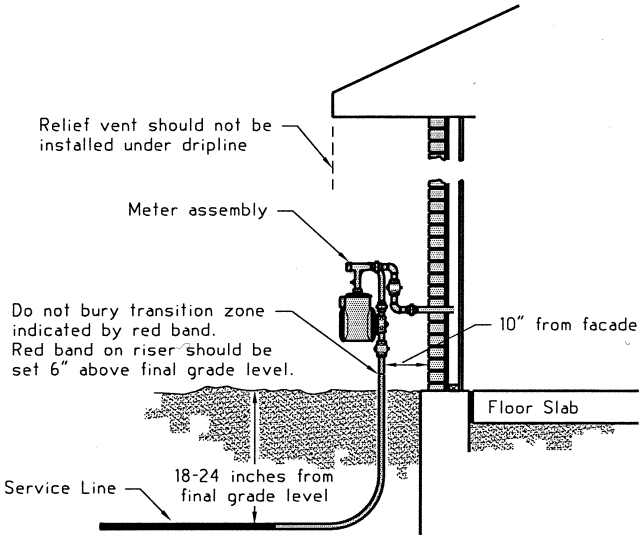
OWNER(s)		**OKLAHOMA NATURAL GAS COMPANY**
	DATE	
	DATE	

Distribution: Operating - Accounting - Customer

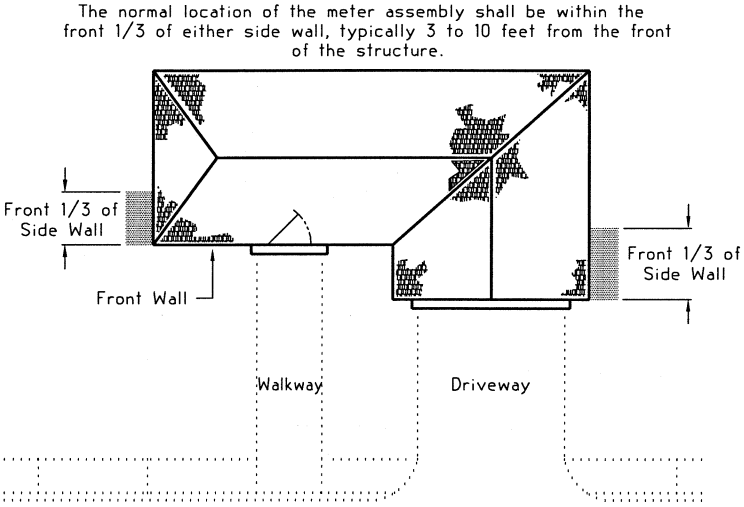
NEW CONSTRUCTION
Rev. Date: 09/28/04



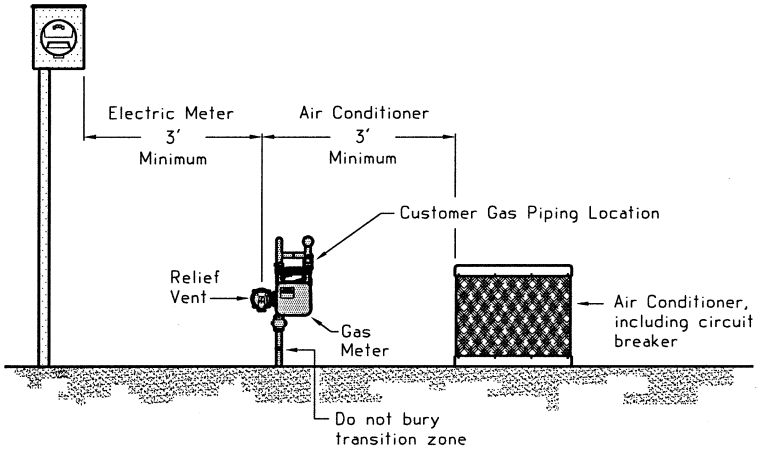
Customer Gas Piping Location
Figure G–2401.5a



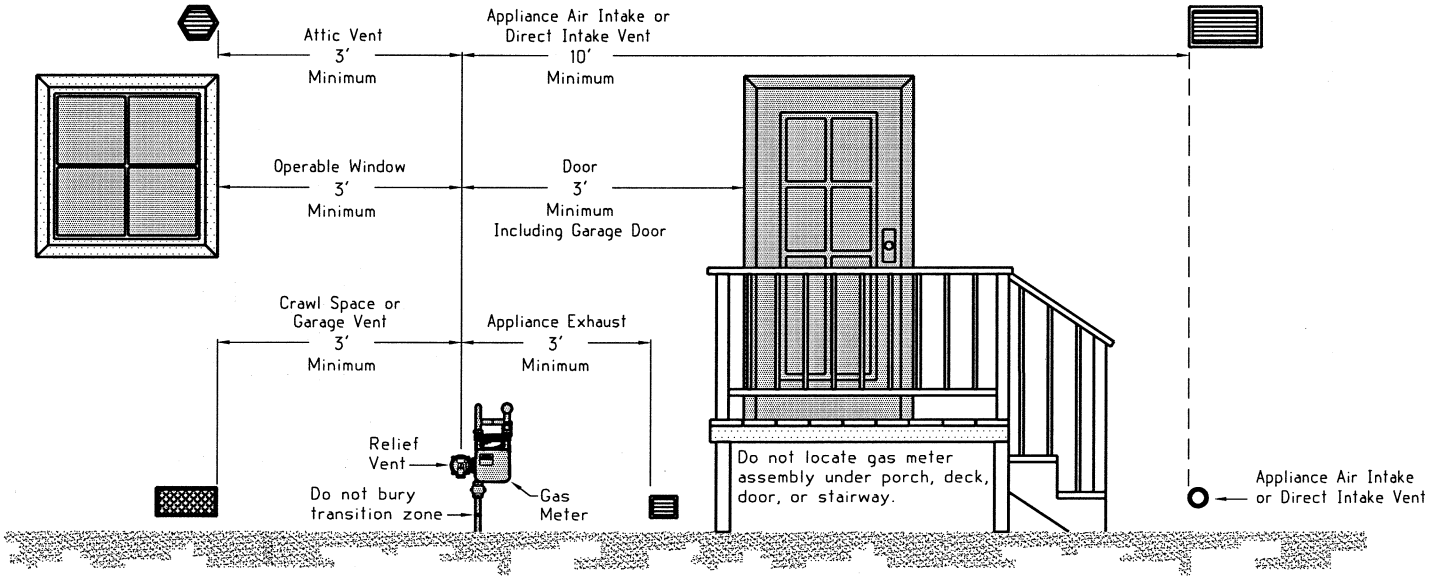
Customer Gas Piping Location
Figure G–2401.5b



Meter Location
Figure G–2401.5c



Gas Meter Clearances
Figure G–2401.5d



Gas Meter Clearances
Figure G–2401.5e

OKLAHOMA NATURAL GAS

2106-04

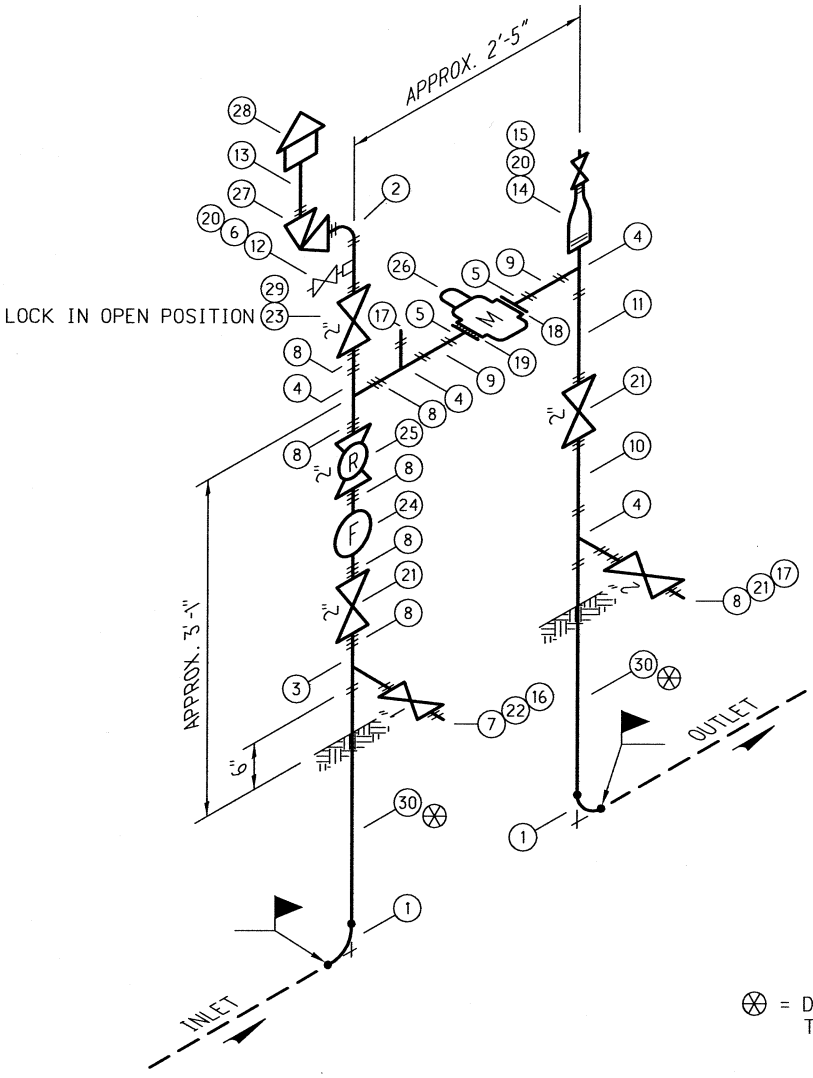
Form 789

GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
3–M Meter, Measurement via Oz or PCI Index, Threaded Outlet

Issued: 03-01-97
Revised: 12-22-04

ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED	ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED
1	2	2"	ELL, STD, SMLS. B, 90° LR	17	2	2"	PLUG, PIPE, STEEL
2	1	2"	ELL, STREET, M.I., 90°, 150# W.P. (Sc.)	18	1	2"	GASKET, NON-ASBESTOS, ANSI 150
3	1	2"x2"x1"	TEE, REDUCING, M.I., 150# W.P. (Sc.)	19	1	2"	INSULATING SET, ANSI 150, 285# W.P.
4	4	2"	TEE, STD, M.I., 150# W.P. (Sc.)	20	2	1/2"	VALVE, BALL, 1000# W.P. MIN. (Sc.)
5	2	2"	FLANGE, FF FLG'D, ANSI 150, 285# W.P. (Sc.)	21	3	2"	VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.)
6	1	1/2"x2 1/2"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	22	1	1"	VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN.
7	1	1"x3"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)				
8	7	2"x3"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	23	1	2"	VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN.
9	2	2"x6"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)				
10	1	2"x10"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	24	1	2"	FILTER, 175# W.P. MIN. (Sc.)
11	1	2"x12"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	25	1	2"	REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761)
12	1	2"x6"	NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG	26	1	2"	METER, ROTARY, 3M-175 w/ COATED BOLTS, 175# W.P. MIN.
13	1	2"x6"	NIPPLE, STD, SMLS. B, 800# W.P., T.O.E.	27	1	2"	VALVE, RELIEF (Sc.) (SIZE ON FORM 761)
14	1	2"x1/2"	NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.)	28	1	2"	VENT CAP
15	1	1/2"	PLUG, PIPE, STEEL	29	1	-	LOCKING DEVICE
16	1	1"	PLUG, PIPE, STEEL	30	9 FT.	2 3/8" O.D.	PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED



⊗ = DETERMINE LENGTH AND THREAD ONE END IN FIELD

OKLAHOMA NATURAL GAS

2106-06

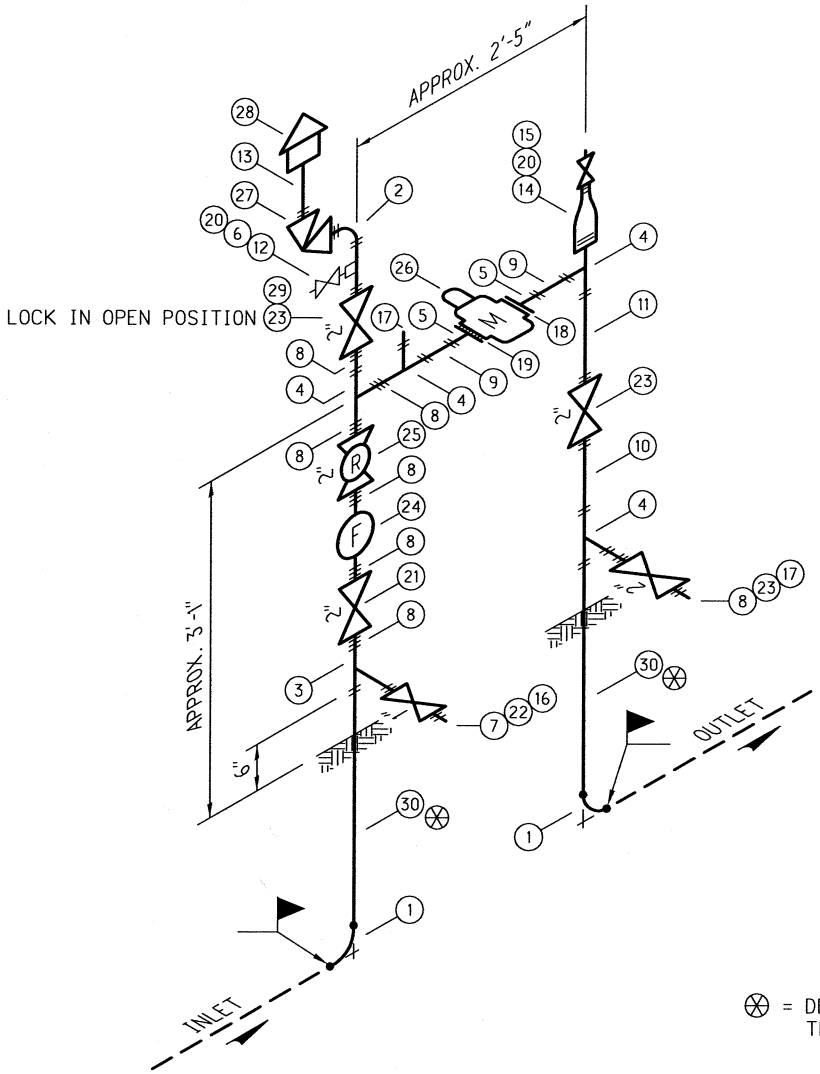
Form 789

GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
5–M Meter, Measurement via Oz or PCI Index, Threaded Outlet

Issued: 03-01-97
Revised: 12-22-04

ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED	ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED
1	2	2"	ELL, STD, SMLS. B, 90° LR	17	2	2"	PLUG, PIPE, STEEL
2	1	2"	ELL, STREET, M.I., 90°, 150# W.P. (Sc.)	18	1	3"	GASKET, NON-ASBESTOS, ANSI 150
3	1	2"x2"x1"	TEE, REDUCING, M.I., 150# W.P. (Sc.)	19	1	3"	INSULATING SET, ANSI 150, 285# W.P.
4	4	2"	TEE, STD, M.I., 150# W.P. (Sc.)	20	2	1/2"	VALVE, BALL, 1000# W.P. MIN. (Sc.)
5	2	2"x7 1/2"	FLANGE, REDUCING, FF FLG'D, ANSI 150, 285# W.P. (Sc.)	21	1	2"	VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.)
6	1	1/2"x2 1/2"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	22	1	1"	VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN.
7	1	1"x3"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)				
8	7	2"x3"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	23	3	2"	VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN.
9	2	2"x6"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)				
10	1	2"x10"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	24	1	2"	FILTER, 175# W.P. MIN. (Sc.)
11	1	2"x12"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	25	1	2"	REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761)
12	1	2"x6"	NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG	26	1	3"	METER, ROTARY, 5M-175 w/ COATED BOLTS, 175# W.P. MIN.
13	1	2"x6"	NIPPLE, STD, SMLS. B, 800# W.P., T.O.E.	27	1	2"	VALVE, RELIEF (Sc.) (SIZE ON FORM 761)
14	1	2"x1/2"	NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.)	28	1	2"	VENT CAP
15	1	1/2"	PLUG, PIPE, STEEL	29	1	-	LOCKING DEVICE
16	1	1"	PLUG, PIPE, STEEL	30	9 FT.	2 3/8" O.D.	PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED



⊗ = DETERMINE LENGTH AND THREAD ONE END IN FIELD

OKLAHOMA NATURAL GAS

2106-08

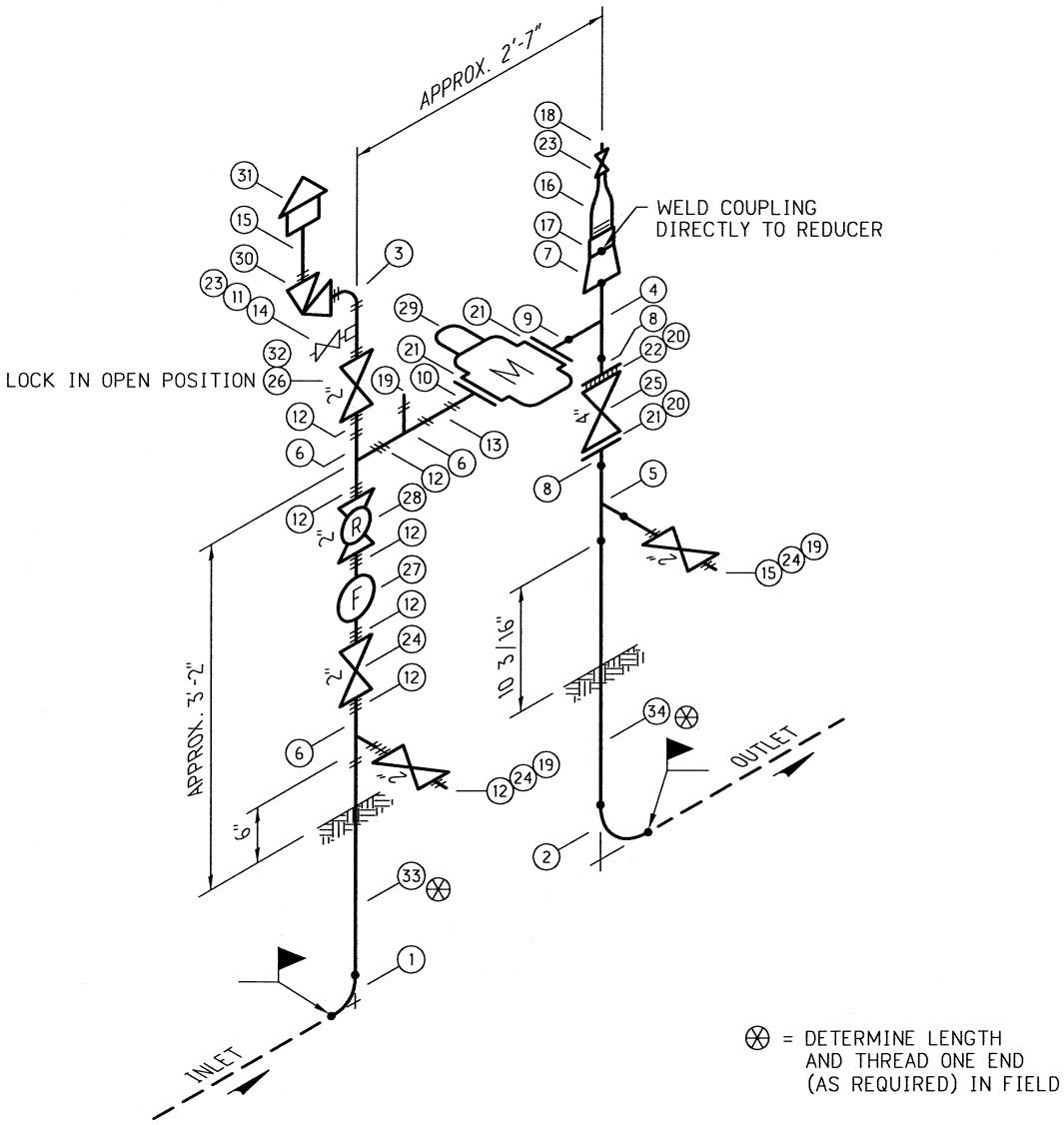
Form 789

GOSM – Standard Drawings Manual

Subject: **Rotary Meter Setting, MP (60 Psig and Less) Inlet Design**
11–M Meter, Measurement via Oz or PCI Index

Issued: 03-01-97
Revised: 12-22-04

ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED	ITEM	QTY	SIZE	DESCRIPTION OF MATERIAL REQUIRED
1	1	2"	ELL, STD, SMLS. B, 90° L.R.	19	3	2"	PLUG, PIPE, STEEL
2	1	4"	ELL, STD, SMLS. B, 90° L.R.	20	16	5/8"x3 3/4"	BOLT, STUD, w/ 2 HEX NUTS
3	1	2"	ELL, STREET, M.I., 90°, 150# W.P. (Sc.)	21	3	4"	GASKET, NON-ASBESTOS, ANSI 150
4	1	4"	TEE, STD, SMLS. B	22	1	4"	INSULATING SET, ANSI 150, 285# W.P.
5	1	4"x4"x2"	TEE, REDUCING, STD, SMLS. B	23	2	1/2"	VALVE, BALL, 1000# W.P. MIN. (Sc.)
6	3	2"	TEE, STD, M.I., 150# W.P. (Sc.)	24	3	2"	VALVE, BALL or NON-LUB. PLUG, 175# W.P. MIN. (Sc.)
7	1	4"x2"	REDUCER, STD, SMLS. B	25	1	4"	VALVE, BALL or NON-LUB. PLUG, RF FLG'D., 175# W.P. MIN.
8	2	4"	FLANGE, WN RF, ANSI 150, 285# W.P.	26	1	2"	VALVE, BALL or NON-LUB. PLUG, FULL CAPACITY, (Sc.) 175# W.P. MIN.
9	1	4"	FLANGE, WN FF, ANSI 150, 285# W.P.				
10	1	2"x9"	FLANGE, REDUCING, FF FLG'D, ANSI 150, 285# W.P. (Sc.)	27	1	2"	FILTER, 175# W.P. MIN. (Sc.)
11	1	1/2"x2 1/2"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	28	1	2"	REGULATOR, SERVICE (Sc.) (SIZE ON FORM 761)
12	7	2"x3"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	29	1	4"	METER, ROTARY, 11M-175 w/ COATED BOLTS, 175# W.P. MIN.
13	1	2"x6"	NIPPLE, STD, STEEL, 500# W.P. (Sc.)	30	1	2"	VALVE, RELIEF (Sc.) (SIZE ON FORM 761)
14	1	2"x6"	NIPPLE, TEST, STEEL (Sc.) w/ 1/2" COUPLING & PLUG	31	1	2"	VENT CAP
15	2	2"x6"	NIPPLE, STD, SMLS. B, 800# W.P., T.O.E.	32	1	-	LOCKING DEVICE
16	1	2"x1/2"	NIPPLE, SWAGE, X-HVY, SMLS. B, 2000# W.P. (Sc.)	33	5 FT.	2 3/8" O.D.	PIPE, 3.65# (0.154" W.T.), SMLS. B, FBE COATED, PRETESTED
17	1	2"	COUPLING, F.S., 3000# W.P. (Sc.)	34	5 FT.	4 1/2" O.D.	PIPE, 10.79# (0.237" W.T.), SMLS. B, FBE COATED, PRETESTED
18	1	1/2"	PLUG, PIPE, STEEL				



OKLAHOMA NATURAL GAS CO.

CONTACT LIST APRIL, 2010

FOR EMERGENCIES DURING REGULAR WORKING HOURS 8:00 AM THRU
: 5:00 PM, CALL 1-800-551-6601 OR 1-405-247-2345. OR FOR FORT SILL: 580-353-1985/ 580-695-0499

FOR AFTER HOUR EMERGENCIES CALL: 1-800-551-6601

CONTACTS IN ORDER:

ROBERT SIMS, MANAGER, FORT SILL:
OFFICE: 580-353-1985
CELL: 580-695-0499
HOME: 580-588-3333

DAVID BURNS: OPERATING TECH, FORT SILL
CELL: 405-933-1076
HOME: 405-247-9871

STEVE GIBSON: OPERATING SUPERVISOR
OFFICE: 405-247-1222
CELL: 580-515-1507
HOME: 405-247-2203

DAVID ALLEN: MEASUREMENT
OFFICE: 405-247-1232
CELL: 580-774-8708
HOME: 405-247-2654

RON TAYLOR, AREA MANAGER
OFFICE: 405-247-1231
CELL: 405-641-5969
HOME: 405-247-6709

Appendix GG

Requirements for Contractor Applied Pesticides

Requirements for information for contractor applied Pesticides
Minimum of 3 days prior to proposed application

1. Copy of current State License for company and applicator.
2. Copy of current company insurance verification for vehicle and Pesticide application coverage
3. Square footage of treatment area and linier feet of vertical (thickened slab GC must provide to subcontractor)
4. MSDS and label of Pesticide. The only Installation authorized pesticide for pre-treatment are:

    - TERMIDOR 80WG 80.00% (Fipronil)
    - TERMIDOR SC 9.10% (Fipronil)

    Due to the effectiveness and low odor, AEC requires TERMIDOR 80WG or TERMIDOR SC be used.

5. Nomenclature of pump, and sprayer, (if possible- not required)
6. Mixing tank capacity
7. A written plan of application to include dilution calculations and application.
8. All chemical containers to be used will be unopened (seal and label intact) and inspected by Government Rep. or Installation Pest Management Coordinator
9. All empty containers shall be disposed of off-post.
10. All submittal requirements of the contract.
11. The Label is the Law. Label information shall be strictly followed!

21 days prior to proposed application

If a different chemical is requested for use, DPW pest management coordinator must have the MSDS and a copy of the label 3 weeks in advance of proposed treatment to see if chemical is legal in Oklahoma and attempt AEC approval.

Day of Application and submittal was approved

1. Demonstrate with water only, calibration of spray equipment and applicator
2. Government inspects unopened pesticide containers
3. Rain must not be expected the day of application (Label is the Law)
4. Contractor shall prepare a certification document to include Name of chemical, percent of active ingredient, pounds of active ingredients that were applied to the site, and total square footage / Linier footage (witch ever applies) that received pesticide. There shall be a signature line for the Applicator and the Government Representative.

APPENDIX HH

SITE COORDINATION PACKAGE

Available on the following ftp site to download:

ftp://155.88.25.15/w912bv09r2023/TO_XX02_SILL_BNHQ/SITE_PKG/

ACCESS INSTRUCTIONS:

1. Use a Windows explorer window in lieu of an internet explorer window to access the files.
2. Use lower case letters for the User Name & Password.
   USER NAME & PASSWORD = transfer
3. COPY – do NOT MOVE – the files from the ftp site to a hard drive, CD, or DVD.

APPENDIX II

DESIGN SUBMITTAL DISTRIBUTION MATRIX

DESIGN SUBMITTAL DISTRIBUTION MATRIX
(Refer to Section 01 33 16 DESIGN AFTER AWARD)

Activity	Full-Size Dwgs	Half-Size Dwgs	Design Analyses & Specs (Hard copy)	CD-ROM (PDF & .DGN)	FF&E	SID	BIM DVD
Commander, USAFACAFS Attn: Jeffrey Banner Building 1950 Barbour Rd. Fort Sill, OK 73503-0159 (580) 442-6639	-	12	7	12	2	2	1
USACE, Tulsa District Attn: Gregory Sowle, CESWT-EC-DM 1645 S. 101 E. Ave. Tulsa, OK 74128-4609 (918) 669-7324	1	7	7	7	2	2	2
Resident Engineer Office Attn: Rick West US Army Corps of Engineers Building 1945 Barbour Road Ft Sill, OK 73503-0159 (580) 581-4118	1	2	2	2	-	-	1
Resident Engineer Office US Army Corps of Engineers Attn: Christy Gordon Building 1945 Barbour Road Ft Sill, OK 73503-0159 (580) 581-4156	-	-	-	1	2	1	-
US Army Corps of Engineers Attn: Todd Hughes Building 1950 Barbour Road Ft Sill, OK 73503-0159 (580) 581-4116	-	1	1	1	-	-	-
USAIEC-RDED; ISEC AMSEL_IE_DE_IN_OP Attn: G. Gaffney 1435 Porter St. Suite 230 Ft Detrick, MD 21702 (301) 619-6501	-	1	1	1	-	-	1
HQ TRADOC DCSPIL Attn : Chip Williams Bldg 5, Northgate Road Ft. Monroe, VA 23651 (757) 788-2353	-	1	1	1	-	-	-
USACE, Ft. Worth District Attn: John Oblak, CESWF-EC-D Rm. 4A05 819 Taylor Street Ft. Worth, TX 76102 (817) 886-1754	1	1	1	6	2	2	2

*AM2 APPENDIX JJ
SUPPLEMENTAL REQUIREMENTS

ADVANCED INDIVIDUAL TRAINING (AIT) BARRACKS COMPLEX
BATTALION HEADQUARTERS (AIT BN/HQ)
FORT SILL, OK

This appendix contains supplemental/revised requirements to Section 01 10 00 STATEMENT OF WORK, Paragraph 6, that must be included in the project design and construction.

The following paragraphs supersede corresponding paragraphs of Section 01 10 00:

6.3.3.3 Vehicular Circulation

(a) Design and construction of the site pavement (outside of the 5 ft. line) to provide access for Ft. Sill's fire trucks will be accomplished by the Infrastructure Contractor. The turning radius of the ladder truck is 75-feet 6-inches and weight is 30 tons. D/B Contractor to coordinate design inside 5 ft line with the Infrastructure Contractor.

(b) See Appendix HH for additional information.

6.6.1.4 Use the following seismic acceleration parameters for mapped Maximum Considered Earthquake spectral response at short periods and at 1-second period, respectively: Ss: 38(%g) and S1: 9(%g).

AM5 6.11.1.1 Contractor shall integrate all new facilities into the existing EMCS database and monitoring and controls software (such as the Post-wide demand limiting) which will require generation of custom graphics matching the style and complexity of the existing graphics. Integration of new facilities shall also include programming of alarm handling and demand load limiting capabilities, which will require Directorate of Public Works (DPW) input for critical alarm lists and prioritization of buildings for demand load limiting. Integration shall be done at either of the existing EMCS "front ends" by qualified companies and personnel. Fort Sill uses two EMCS programs: Trane Building Automation System or Tour Andover Controls (TAC), thus two front ends available.

6.13 FIRE PROTECTION

6.13.1 Fire Sprinkler Service: Provide a separate fire sprinkler service connection (FDC) within each building that requires fire sprinklers. Provide remote FDC located with Post Indicator Valve (PIV) with tamper switches and Fire Hydrant within bollards required for protection located outside building collapse zone (1 ½ times the height of the building) and placed at curb. PIV will be installed at a minimum of 40 feet from building. The Contractor will provide the Post Indicator Valve (PIV) and any bollards required for protection and route the fire water line (separate from the domestic supply) to 5 feet from the building. Provide for all piping from the 5-foot line of the building and within the building. Provide Knox Box (3200 series) and install 5 feet above grade. The Knox Box will be installed to the right side of the entrance door. Top of the Knox Box will be 5 feet from finished or finished concrete entrance. Go to www.knoxbox.com to order. Enter 73503 zip code and select Fort Sill Fire Department from menu.

6.13.2 Provide fire hydrants. Fire Flows are to be completed by the Contractor and verified by Corp of Engineers and/or Fort Sill Fire Department.

6.13.2.1 Fire Apparatus Access: Shall provide a minimum of one (1) all weather ground access to allow emergency vehicles unimpeded access to building. This includes proper turnarounds, fire lanes and special provisions for aerial apparatus in accordance with UFC-3-600-01, 2-10. Proper turnaround will consist of a circular turnaround large enough to allow fire departments largest apparatus to easily make a turnaround to exit from the facility. At no time will a fire apparatus have to backup in order to exit from a facility. At a minimum, fire apparatus must have paved access to facilities main entrance side to include one other side of said facility.

6.13.3 Riser Location: Install fire risers in a dedicated space or mechanical room with external access and keyed to the DCF-1 for the Fire Department.

6.13.4 Fire Sprinkler Seismic Design: Since the installation is located in a seismic zone, design fire sprinkler systems for protection of piping against damage from earthquakes per NFPA 13.

6.13.5 Fire Sprinkler Backflow Prevention: Double check valve backflow preventers are the minimum protection required for all sprinkler systems. Systems utilizing antifreeze require reduced pressure principle backflow preventers.

6.13.6 Mass Notification System (MNS)/Public Address (PA): The MNS system shall be fully functioning and shall be designed and installed to operate as both MNS and PA. If MNS is used as a PA system there shall be a separate microphone installed for that purpose. All LOC panels are to be installed without locks. Fire Department recommends recessed/semi-recessed panel. NFPA 72 and AHJ request all initiating devices be labeled to assist in locating specific devices. The systems shall be zoned and permit zonal selection of paging by both installed microphone jacks and telephone dialup. Indicating devices shall be visual and located throughout the facility including exterior wall locations. Any notifying device with expander has to be incased by red cover. All strobes for the MNS shall be synchronized with the fire alarm strobes in the event both are active at the same time. The MNS shall have the ability to interrupt all localized audio systems that are independent of the building-wide PA system. The Installation-wide giant voice system is an ADT MNS. Each building shall communicate with the ADT Central Control Unit via an existing radio frequency transmitter and antenna. Furnish and connect the following equipment:

a. One (1) mass notification panel in accordance with the requirements of UFC 4-021-01 and compatible with the existing giant voice system at Fort Sill.

b. One (1) transceiver with the ability to communicate with the Installation's big voice radio frequency (RF) equipment with the ability to transmit and receive information.

c. Install One (1) antenna at the facility.

d. Connect eight (8) dry contacts to the building MNS for controlling messages and push-to talk for audio (remainder of the eight (8) shall become spares). Specific messages shall be provided by the Fire Department so that all MNS will be the same throughout Fort Sill per UFC 4-021-01 APPENDIX B. Connect the 600-ohm audio for audio from the central control unit to the MNS. MNS will be tested in conjunction with the Fire Alarm System.

6.13.7 Fire Alarm Systems: Provide Class A addressable systems consisting of a fire alarm panel, an RF transceiver, initiating devices and notification devices. The Fire Alarm Control Panel shall be fully compatible with the existing Monaco D21 system. Alarm Panels or MNS shall not be installed in communication rooms. Alarm Panels shall be installed in a conditioned space. Remote Annunciator Panels shall be installed at main entrance in the hallway. Provide pull stations that are single-action, non-glass rod type at all exits. Annunciator panel needs to be key accessible to allow supervisory access. Pull stations needs to be keyed type.

6.13.7.1 Installation Preference No. 5: Provide the required fire alarm system with 72 hours of standby with 15 minutes of alarm. In addition, secondary (stand-by) power should provide as follows: immediately upon loss of normal AC power, the stand-by source of power shall provide a minimum of 72 hours of standby with 60 minutes of mass notification at the maximum connected load.

6.13.7.2 The RF transceiver shall be a Monaco BT-X on a frequency of 141.365 MHZ. Provide transceiver communication with the Lawton, Oklahoma 911 dispatch located off Post.

6.13.7.3 The fire alarm receiving system is a Monaco D-21 system.

6.13.7.4 Provide zone by zone information sent to the Fire Department receiving system. Send All tamper devices to the D-21 system as a supervisory tamper.

6.13.7.5 Provide all initiating devices that are connected, Class A, Style D, to signal line circuits (SLC), Style 6. Conduit shall be a minimum four (4) feet apart.

6.13.7.6 Provide all alarm appliances connected to notification appliance circuits (NAC), Class A, Style Z.

6.13.7.7 All smoke detectors shall be powered through the fire alarm panel.

6.13.8 Air Duct Smoke Detectors on Air Handling Units: Upon any general alarm all air handling units shall shut down and automatically restart when alarm panel is cleared. The only exception to this is a unit less than 2000 cfm and does not move air from its original room into another. Shut-down relay/contact must be powered from the fire alarm control panel.

6.13.9 Furnish all software, software locks, special tools and any other proprietary equipment required to maintain, add devises to or delete devices from the system or test the fire alarm system prior to the final inspection of the system.

6.13.10 Fire Extinguishers: Fire Extinguishers and Fire Extinguisher Cabinets are to be provided in the contract. Fire Extinguishers are to be 10 lbs. ABC. Fire Extinguisher Cabinets need to be white in color, semi-recessed, properly labeled, and with glass doors. *

*AM4 The following paragraph supersedes paragraph 6.5.4.2, subparagraph (b):

"(b) Provide each occupied facility with an appropriately sized room that has been "hardened" to resist the forces of tornadoes which are prevalent in Oklahoma. Provide room in accordance with ICC-500 and FEMA 320."*

*AM5 References to "Appendix J" in the following paragraphs shall be replaced with "Appendix HH". All other text remains unchanged:

"6.3.1.3 Site Design. The Government will designate approximate building site locations and related site features within the drawings included in ~~Appendix J~~ Appendix HH. Since finish grades….The Infrastructure Contractor is typically responsible for design and installation of the surrounding walkways, courtyards, gathering areas, site amenities and parking areas within the site constraints as shown on the drawings, except or organizational parking that is associated with such facilities as the Tactical Equipment Maintenance Facilities, as designated on the Site Drawings in ~~Appendix J~~ Appendix HH, which are the responsibility of the Contractor…."

6.4.6.1:
"(a) Storm Drainage System Tie-in points are shown in the drawings at ~~Appendix J~~ Appendix HH. Tie into these systems as appropriate.

(b) Natural Gas distribution lines are shown on drawings at ~~Appendix J~~ Appendix HH. Coordinate point of connection….

(c) Water mains are shown on the drawings at ~~Appendix J~~ Appendix HH. Coordinate points of connection….

(e) Electricity: Others will provide the electrical distribution….See ~~Appendix J~~ Appendix HH for drawings. Complete the design….

(f) Communications. See ~~Appendix J~~ Appendix HH for Communications service plans and capacities. Coordinate through….

(h) Others will provide telephone system distribution design. Local Telephone Service tie-in points are shown on the drawings at ~~Appendix J~~ Appendix HH. The Infrastructure Contractor…." *

***AM6 The BN/HQ Contractor shall be responsible for providing the pad-mounted transformer, including and conduit, wiring, grounding, etc. Refer to Appendix HH, Drawing ES102, General Note 2. BN/HQ D/B**

Contractor shall be responsible to coordinate work through the COE with the Infrastructure Contractor. BN/HQ D/B Contractor shall also provide the screen wall for the transformer.*